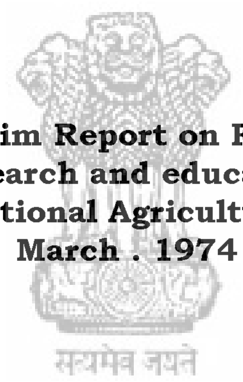

Interim Report on Forest Research and education (National Agriculture)

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SUMMARY OF RECOMMENDATIONS

NEW ORIENTATION IN FOREST RESEARCH

1. Forest research should be re-grouped into (i) forestry and biological research, (ii) industrial and utilisation research, and (iii) forest management and operations research, including statistics, economics and marketing research, and organised at three levels, namely State, regional and national. In the reorganisation of research, the in-built specialisation that exists at present in the Forest Services should be taken advantage of.

(Paragraph 3.12)

2. Facilities required to carry out basic and applied research bearing on forest should be built up in the agricultural universities. Other universities may also organise research on forest problems to the extent feasible and possible. For this purpose, the State forest departments should provide the necessary facilities and support. The universities could involve themselves in applied research also as joint programme with the Central and State forest research organisations, for which it may be expedient to have research workers with knowledge of forestry.

(Paragraphs 3.13 & 3.16)

3. The State forest departments should confine themselves primarily to applied research of a local nature in the field of forestry, forest biology and forest management. In other fields of research, such as utilisation, harvesting, economics, marketing, etc., they may act in coordination and collaboration with the universities and the Central research organisations. The State Governments may, if necessary, establish properly equipped and staffed research institutes for the purpose, keeping in view the size of the State forests, the complexities of their problems and the prospects of their development. Such institutes should work in close collaboration with the Central forest research organisations and the universities. The State forest departments will also have to undertake adaptive research in connection with social forestry.

(Paragraphs 3.17 & 3.18)

4. In addition to basic research bearing on forest, the Centre should shoulder the responsibility of applied research of regional and national importance, besides the coordination and collaboration in the fields mentioned above. Even in subjects taken up by the States, the Centre may have to take the responsibility of research on such applied problems as are of long term nature, requiring outlay and expertise which the States may not be in a position to provide. The Centre may also have to take upon itself the responsibility of applied research of a local nature in States having smaller forest resources and inadequate research base.

(Paragraph 3.19)

5. The industrial research, which requires a large capital investment and special expertise and equipment, should be the responsibility of the Centre. It should include studies on the developmental and/or the pilot plant stage. There should be a well organised unit of industrial design, to expedite commercial exploitation of proven pilot experiments.

(Paragraphs 3.19 & 3.22)

6. The Central Government should set up, where necessary, multi-disciplinary regional forest research institutes as part of its research responsibilities. The Forest Research Institute, Dehra Dun should continue to be the premier Institute and enjoy the status of a National Institute. In addition, there might be centres to take up specific problem-oriented research projects.

(Paragraphs 3.20 & 3.24)

7. The survey of forest soils in the States should be one of the activities of the State forest research organisations, and should particularly aim at delineation of forest soils. A collaboration with the All India Soil and Land Use Survey Organisation and coordination with the State Coordination Committees for soil survey and the Central forest research organisations would be necessary in the matter of survey of forest soils.

(Paragraph 3.25)

8. The Forest Corporations and the forest-based industries should have their own research sections, but depending upon the nature and complexities of the problems, they may refer the same, and simultaneously extend financial support, to the Central and State research organisations or universities.

(Paragraph 3.28)

9. For the purpose of dissemination of research results and keeping track of their application in the field, there should be Development Officers having the appropriate background in the Central and State research institutes/centres. Their functions should be to assist the heads of institutes/centres and research workers by feeding them with information etc. about progress in the application of research and to furnish the practising forestry personnel in the field and the forest-based industries with new research knowledge.

(Paragraph 3.31)

REORIENTATION OF FOREST EDUCATION

10. The agricultural and other universities, which are to undertake forest research, should, to begin with, include forestry as one of the subjects in the undergraduate course, the scope of forest education being gradually widened to graduate, master's and doctorate Degree courses in Forestry, as qualified staff and other facilities needed for research become available. The three elements of teaching, research and extension pertaining to the discipline of forestry should be integrated in the universities.

(Paragraphs 4.7, 4.8 & 4.9)

11. The syllabus of forest education, with equal emphasis on theoretical knowledge and its practical application, should be drawn up by a National Committee, specially appointed for the purpose. The universities should conform, as far as possible, to the syllabus so drawn up in the interest of uniformity in forest education in the country.

(Paragraph 4.9)

12. The Forest Research Institute, Dehra Dun, should organise graduate, master's and doctorate Degree courses in Forestry.

(Paragraph 4.9)

13. The Indian Forest Service (Recruitment) Rules and Regulations should be so modified as to include forestry as one of the elective subjects in the competitive examination for the Indian Forest Service. The States should give preference to the university graduates in forestry, or with forestry as one of the subjects, in the recruitment of the State Forest Services officers and Forest Rangers; but the candidates so selected must go through the course of in-service training and education.

(Paragraph 4.10)

14. In-service training and education for the higher Forest Services, namely, the Indian Forest Service and the State Forest Services, should continue to be the exclusive responsibility of the Centre, and be imparted at the Forest Research Institute and Colleges, Dehra Dun. In-service training and education for the Forest Rangers, also a responsibility of the Centre, should be imparted at the Rangers' Colleges as constituents of the centres where the research facilities for at least the basic subjects exist or can be easily created.

(Paragraphs 4.11 & 4.16)

15. The courses for the in-service training and education for the higher Services should be adjusted to make them equivalent to the corresponding Degree courses in the universities. After that, either a university could be approached for affiliation of the Indian Forest College, Dehra Dun, as one of its constituent colleges, or a university or the Inter-University Board approached for recognition of the Associateship of the Indian Forest College as equivalent to an appropriate Degree.

(Paragraph 4.12)

16. In the case of in-service training and education for the higher Services, the teachers should not only be specialists in respective subjects but also be actively involved in research work. The research worker should also be drawn into the forest education. Posts of professors, associate and assistant professors should be created in the teaching cadres in line with the pattern which obtains in the academic institutions. Similar integration of research and education should be attempted in the research-cum-teaching institutes imparting in-service training and education to the Forest Rangers.

(Paragraph 4.13)

17. The syllabus for in-service training and education for the higher Services should place more accent on tutorials in those disciplines, which a student did not have in his university career. All students, irrespective of the above arrangements, must pass the examination in all the prescribed subjects.

(Paragraph 4.15)

18. In some specialised fields, obtaining the services of experts for lectures from universities and other institutions should

be resorted to, where necessary. There should also be some bilateral arrangement for exchange of fellowships or professorships between the Forest Research Institute, Dehra Dun and universities and other institutions.

(Paragraph 4.17)

19. Each individual, receiving in-service training and education in the higher Services, should be associated with problem-oriented field projects in the last six months of the training period, as part of his dissertation.

(Paragraph 4.18)

20. The States should consider locating the research institutes/centres at the same place as the Deputy Rangers/Foresters' school and *vice versa*. When such an arrangement is not possible, the teachers having research experience should be chosen. Each State, either singly or in collaboration with neighbouring States, should make arrangements for opening training schools for the Forest Guards.

(Paragraphs 4.19 & 4.20)

SPECIALISATION IN FORESTRY

21. In addition to continuing and liberalising scholarships for research workers to enable them to take up research at the Forest Research Institute, Dehra Dun, and instituting scholarships at the universities, supernumerary posts should be created in the Forest Research Institute to enable the State officers, who have previous record of practical forest management and study of related subject under field conditions, to continue their line of specialisation or research on approved projects.

(Paragraph 5.5)

22. Short or medium term courses in specialised fields should be arranged for the forestry personnel in institutions or universities considered most suitable.

(Paragraph 5.6)

23. While passing the offers for medium-term (generally of six to twelve months' duration) academic courses, field study tours, orientation courses etc., available abroad in different aspects of forestry, on to the States/Union Territories for sponsoring the

names of candidates, due regard should be paid to the number of personnel already trained in the States/Union Territories concerned in the particular branch of study.

(Paragraph 5.8)

24. Candidates for short-term (generally of less than three months' duration) study tours, seminars, workshops, etc. outside the country should be sponsored from amongst those who have the requisite basic or specialised knowledge or are working in the specialised fields. The Central Government should propose the selection, bearing in mind the necessity of broadening the base of specialisation evenly in different States/Union Territories, and seek for the concurrence of the concerned States/Union Territories, for deputation.

(Paragraph 5.9)

DIRECTION AND PROMOTION OF FOREST RESEARCH AND EDUCATION

25. A Council of Forest Research and Education (CFRE) should be set up in the Union Ministry of Agriculture under the chairmanship of the Cabinet Minister of Agriculture, and with members as suggested in this Report. The CFRE should have, amongst others, the following functions :

(i) to coordinate, promote, and lay down broad policies of, forest research and education in India;

(ii) to sponsore All-India coordinated research projects and programmes in the field of forestry;

(iii) to evaluate forest research and development in the Central research institutes/centres and the universities, and for this purpose, appoint committees for undertaking research achievement audit every five years;

(iv) to approve syllabi for the in-service training and education of forestry personnel in the Central research-cum-teaching institutes and to review them periodically; and

(v) to have a realistic assessment made of technical manpower, including each category of specialisation, needed at professional levels in forest management, research and industries.

With a view to servicing the CFRE, a Chief Coordinator having long association with forest research and education should be inducted in the organisation of the Inspector General of Forests and given the status of an Additional Inspector General of Forests.

(Paragraphs 6.4 & 6.5)

26. The various disciplines of forest research and education should be grouped into the following three Wings:—

(a) Forestry, Forest Biology, Forest Management and Operations Researches;

(b) Forest Industrial and Utilisation Researches; and

(c) Forest Education and Training.

Each Wing will be under the charge of a Coordinator with experience in research or education in the respective sphere and with the status of Deputy Inspector General of Forests, who would also act as Secretary to the Standing Committee to be set up, one for each Wing.

(Paragraphs 6.6 & 6.7)

27. The functions of the Standing Committees would be:

(i) to assist and advise the CFRE in respect of matters pertaining to research and education in their respective sphere;

(ii) to initiate and examine schemes and projects of research and education in their respective sphere;

(iii) to review and coordinate research and education activities in their respective sphere; and

(iv) to perform such other functions as may be assigned to them by the CFRE from time to time.

(Paragraph 6.7)

IDENTIFICATION OF PROBLEMS AND FORMULATION OF PROGRAMMES

28. Two Technical Committees should be set up by the CFRE for each region to be attached to its first two Wings for identification of research problems. These Committees should pass on the problems after assessing priorities to the Forest Research Institute,

Dehra Dun, regional and State institutes/centres for formulation of research programmes by Technical Panels, one each for a discipline or a group of allied disciplines.

(Paragraph 7.4)

29. On the basis of the research programmes formulated by the Panels, Regional Conferences should be convened for a thorough discussion, in which all the States, the universities taking up forest research and the forest based industries in the region should be invited to participate. The recommendations of the Conferences should be available to the Inspector General of Forests before the approach for the next Plan is drafted for approval by the CFRE.

(Paragraph 7.5)

30. For comparing notes, facilitating exchange of ideas and promoting interaction, the research workers and others working on the same or related problems should periodically meet in workshops, seminars, symposia, etc. In addition, two Conferences on an All-India basis, one on forestry and forest biology and the other on forest products, should be organised by the CFRE ordinarily coinciding with the mid-Plan period, for a critical review of the current research programmes and their achievements in the context of advances made elsewhere.

(Paragraph 7.6)

31. The accent in future in all research institutes/centres should be on speedy implementation of research programmes, with suitable powers delegated at all levels. Once the programmes are formulated and approved and allocation of funds is made, the institutes/centres should have full authority for incurring expenditure and undertaking reappropriation, subject to rules.

(Paragraph 7.7)

FUNDING FOR RESEARCH AND EDUCATION

32. In the Five Year Plans, the total funding for forest research and education should not be less than 1 per cent of forestry and logging sector's contribution to the Gross Domestic Product at current prices.

(Paragraph 8.12)

33. A major part of funding for forest research and education should be borne by the Central Government, and it should particularly devolve on the CFRE to fix priorities of schemes for funding. The States should also provide adequate funds for applied research schemes and give priority for the setting up of research institutes in the States where necessary.

(Paragraph 8.13)

34. The prospect of a levy of an R&D cess on industrial products of Forest Corporations and forest-based industries and a cess or surcharge on sales tax on forest produce at the primary stage should be explored as a source of finance for R&D in forestry.

(Paragraph 8.15)

35. The universities should formulate the research programmes well ahead of each Plan period and intimate the CFRE about the level of funding required.

(Paragraph 8.16)

PERSONNEL POLICY FOR RESEARCH AND EDUCATION

36. Personnel of the ranks of Research Officers or equivalent and above in forest research and education in all the Central and State research institutes centres should be selected from individuals preferably having forestry background. Direct recruitment of experts from the open market for forest research and education should be resorted to, whenever a shortage or non-availability of specialists arises in any discipline in the cadre of the Indian Forest Service. For State research organisations, recourse should be taken to obtain personnel on deputation from the universities on tenure basis in case of non-availability of specialists in the Forest Services.

(Paragraphs 9.7 & 9.8)

37. Only a minimum tenure on deputation (with option for extensions) should be laid down for Forest Officers engaged in research and education; there should, however, be no permanent secondment. Such personnel should be selected only after they have a spell of service in the field to build up necessary practical forestry background.

(Paragraph 9.9)

38. For the grades below the Research Officers, movement between field staff and research and teaching staff should be encouraged. The research and education personnel should thus return for a spell of field work after a stint in research and teaching.

(Paragraph 9.10)

39. A certain percentage of the posts of Research Officers, Research Assistants and Technical Assistants should be filled from State Forest Service Officers, the Forest Rangers and the Deputy Rangers/Foresters from the States.

(Paragraph 9.11)

40. Specialists recruited directly from outside the Forest Services, when appointed to forest research jobs in the Government research organisations or universities, should undergo special short courses on forestry in the Forest Research Institute, Dehra Dun. They should also be attached to the Forest Departments in the field to work for sometime on any project related to their disciplines. In addition, summer camps should be opened under the aegis of the Forest Departments to acquaint them with forest management in the field.

(Paragraph 9.12)

41. Lateral movements for short periods of research workers and teachers should be arranged between the universities and the Central research-cum-teaching institutes, so that the demands and peculiarities of each are better understood by persons pursuing a common cause. Such movements should take place at the end of a service of ten years and over.

(Paragraph 9.14)

42. Arrangements should be made to promote an individual within his discipline, if found merited for promotion. When a higher post in the discipline is not available, the post held by him should be converted to a higher grade as personal to him. In all cases, he should continue to remain in charge of the discipline or branch in which he excels.

(Paragraphs 9.19 & 9.21)

43. Wherever an Indian Forest Service Officer, or any other research worker or teacher in Central or State research organisations, becomes due for promotion to a higher grade in his parent

cadre, because of an available vacancy, he should be retained, if he is willing and is found suitable for promotion by dint of merit in his research or teaching job, by according him the rank or the higher scale of pay in the same post he is holding in forest research and education. For this purpose and for awarding merit promotions, a number of floating supernumerary posts in different super-time scales should be created. The same principles should be followed for retention and promotion of the State Forest Service Officers, Forest Rangers and Deputy Rangers/Foresters.

(Paragraphs 9.20 & 9.21)

44. An internal evaluation committee should be set up in each research institute/centre. The committee's function would be to assess periodically the performance of all research workers and teachers. The assessment report should be considered, while judging their suitability for promotion and/or retention in research and teaching jobs.

(Paragraph 9.22)

45. The research workers in a discipline or a group of allied disciplines should meet at regular intervals to discuss the current research programmes, critically review them and suggest new programmes awaiting investigations. Staff Research Councils, with a membership of not more than ten, should be set up in each research institute/centre to act as advisory bodies in connection with the planning and implementation of the research projects and programmes.

(Paragraph 9.23)

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SECTION I

INTRODUCTION

1.1 The development of any sector is dependent on the research that is undertaken to solve the multifarious problems that crop up in the process. In the forestry sector in this country, research and development could not keep pace with time and need, due to various constraints, organisational, financial and technical. Forest research and education should be revitalised, and it should be possible to REAP the fruit of efforts that would necessarily have to go in—

(i) Research, for solving problems and creating new knowledge;

(ii) Education, for building up expertise and utilising it for the cause of forestry;

(iii) Allocation of funds, for keeping the research and education on an even keel; and

(iv) Personnel policy, for selecting the right man for the right job.

1.2 In its Interim Reports on Production Forestry—Man-made Forests and on Social Forestry, the National Commission on Agriculture has drawn attention to the need for substantial research support to the programmes outlined therein. The Commission is convinced that there is an urgent necessity for creating a sound research base in the forest departments in the States, Universities, Forest Research Institute, Dehra Dun and other Central forest research centres. There should also be a clear distinction with regard to the division of responsibilities for research, utilisation of research findings for development, and coordination and cooperation amongst the Centre, States and Universities. Forest research is essentially applied in nature. As such, the research has to be not only extensive to answer problems covering the wide varieties in bio-climate, but also intensive so that results of research are purposefully and gainfully employed in the future development of forestry. The imperfections and deficiencies of the present system of problem identification, programme formulation, application of results of research in the field etc., which have been highlighted by the Expert Committees* on the Forest Research Institute and Colleges, Dehra Dun, should be considered in future reorganisation of forest research.

1.3 A programme of research cannot be implemented without personnel of the required quality and number, for which adequate facilities for education have to be created in forestry, forest biology, forest products utilisation and marketing, ecology and allied and auxiliary disciplines. Such an education has to cater for basic and applied instruction (including specialised and in-service training) at various levels, to suit varied job-requirements. Education should be geared to research in a complementary manner, so that each is benefitted by the other through a process of mutual feed-back. This complementarity is lacking in the existing system.

1.4 It goes without saying that desired results in research and education cannot be achieved without adequate and effective funding. The funding should have some relation not only to the contribution of the sector to the national economy, but also to the benefit that it brings to the community in social values. The Approach to the Science and Technology Plan† has pointed out that there should be an end to the 'mis-match between distribution of funds for scientific activity and the economic and social importance of the areas of funding'. Seen in this perspective, the existing funding of forest research and education is wholly inadequate, being restricted to what the Central and State allocations provide.

1.5 The personnel policy must take into account the complexities of demands on forests. In the past, the demands on the forests were not heavy; hence it was easier to handle research and education needs with the existing staff and organisation. In order to satisfy the evergrowing and diversified demands on forests, more and more people have to be involved in research and education. Moreover, for forest planning and management, there is a need for in-built specialisation in the Forest Services and specific expertise in production, protection, environmental and social forestry. No rational personnel policy can be evolved unless the foundations are properly laid for the quest for new knowledge.

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*Two Expert Committees were set up by the Government of India in 1956 and 1964 respectively for assessing the work done at the Forest Research Institute and Colleges, Dehra Dun, hereinafter referred to as First and Second Expert Committees.

†National Committee on Science and Technology, New Delhi, January, 1973.

1.6 The Commission felt that these aspects needed clear understanding and immediate attention. A Study Group was, therefore, constituted to examine the various issues relating to forest research and education in depth. The composition of the Study Group is given in Appendix I. The Commission issued Questionnaires (*vide* Appendices II-A and II-B) to various State Governments and Agricultural Universities. The replies to the Questionnaires and the suggestions made by the Study Group as well as a communication by the Vice-Chancellor, University of Calicut, have been duly considered by the Commission in arriving at conclusions and formulating recommendations. The Commission also obtained information on administration of forest research from the Director-General, Forestry and Timber Bureau, Commonwealth of Australia, and the Canadian Forestry Service. Information on forestry education was collected from some of the universities of the United Kingdom viz., Oxford, Cambridge, Edinburgh, Aberdeen and North Wales, Bangor. All the information collected has been made use of in considering the issue of forest research and education in India.

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SECTION II

THE PATTERN OF FOREST RESEARCH AND EDUCATION IN INDIA—A REVIEW

2.1 Forests being a State subject, the primary responsibility in regard to forest management and administration rests with the respective State Governments. The Central Government is charged with the responsibility for the formulation and implementation of high level forest education and research, which it discharges with the help of the Forest Research Institute and Colleges at Dehra Dun (FRI) and its two regional centres located at Coimbatore and Bangalore. The research activities of the State forest departments are mainly field-oriented and are generally carried out in cooperation with the FRI.

Present Organisation of Research

2.2 The functions of the FRI and its centres are to undertake research, both basic and applied, on various problems relating to forestry, forest biology and utilisation of forest products; to establish liaison with State forest departments and industries departments dealing with forests and forest products; to disseminate results of research through publications; to organise study tours, seminars and exhibitions; and to advise various Government departments on matters relating to forests and utilisation of forest products.

2.3 The Forest Research Institute, Dehra Dun, comprises of three Directorates of Research, namely, Forestry, Forest Biology and Forest Products. The chief executive is the President of the Institute, who is directly incharge of the common services, like Statistics, Editorial Board, Publicity and Liaison (Library and Documentation). The Registrar looks after General Administration, Budget and Accounts. The disciplines under each of the Directo rates are distributed as follows:

(a) **Forestry:** (1) Silviculture (General), containing the sections of Plant Introduction, Seed Testing and Experimental Silviculture, Documentation and General; (2) Silvics, covering Ecology, Physiology and Forest Influences; (3) Forest Soil, covering Soil Chemistry, Soil

Physics and Petrology; (4) Minor Forest Products (Collection, Harvesting and Introduction); (5) Management and Mensuration; (6) Forest Genetics; (7) Logging; and (8) Forest Economics; and

(b) **Forest Biology:** (1) Forest Pathology; (2) Forest Entomology; (3) Wood Anatomy; and (4) Systematic Botany; and

(c) **Forest Products:** (1) Cellulose and Paper; (2) Chemistry of Forest Products; (3) Timber Mechanics; (4) Timber Engineering; (5) Composite Wood; (6) Wood Working and Sawmilling; (7) Wood Seasoning; and (8) Wood Preservation.

The Coimbatore centre is concerned with regional problems of research in Entomology, Mycology, Silviculture and Soil Science; and similarly the Bangalore centre deals with Sandal Spikes, Wood Preservation, Wood Anatomy and Chemistry of Minor Forest Products.

2.4 The Second Expert Committee referred to in paragraph 1.2 (*vide* composition and terms of reference—Appendix III) observed ".... there is no sense of urgency in the research programmes of the Institute", and felt "the Institute should adapt itself to the new and challenging situation of the future. Many items on current programmes, though possibly of theoretical and academic interest, are not likely to give practical results which may lead to increased production from forests. Research at the Institute seems to be out of touch with the problems of State Forest Departments and with Industries based on Forest Products ...".

2.5 Some of the reasons for the not so satisfactory performance of the Institute may be ascribed to a lack of a broad research base, absence of closer participation among academic research institutions and other agencies, the absence of awareness of the necessity to modernise research in the State forest departments commensurate with the changed needs of, and the evolution taking place in, field technology. The Second Expert Committee made some valuable observations on how research problems should be identified. According to the Committee, the Institute must fully appreciate the seriousness of the situation arising out of the low productivity of the Indian forests and the urgency to keep pace with industrial requirements for wood and other forest products.

Formulation of Research Programmes

2.6 The system of identification of forestry problems by holding quinquennial silvicultural conferences, which only broadly state the lines of research to be taken up, not unoften much too broadly, followed by formulation of annual programmes for each branch, has by itself failed to produce the desired impact. The annual programmes of each branch have too many items, many of only marginal utility. The silvicultural research programmes of the States are also formulated in the same manner. The quinquennial research programmes of the Utilisation branches, Wood Anatomy and such aspects of Entomology and Pathology as were related to Utilisation, were framed till recently by the branch officers, and placed before the Central Advisory Board on Forest Utilisation for approval.

2.7 In 1963, to achieve better coordination in the formulation of research programmes, a Central Advisory Board of Research was formed. This Board consisted of 28 members with the Secretary, Department of Agriculture acting as the Chairman. One of its primary functions was to examine the quinquennial research programme of the FRI and evaluate the annual programmes of research. In order to perform the latter function effectively, it was decided in the first meeting of the Board in March 1964 to set up Committees on Silvicultural Research; Biological Research; and Research in Logging, Paper and Pulp, Forest Products Utilisation and Timber Engineering. The terms of reference of these Committees were to review the programme of research undertaken at the Forest Research Institute, Dehra Dun and its regional centres, to consider ways and means to stimulate utilisation of research and to coordinate research undertaken by the Institute and its centres and the States. The Advisory Board could meet only twice, once in 1964 and second time in 1965, while the Committees could not function as expected. The terms of appointment of most of the members have since expired. As a result, the implementation of the programmes could not be reviewed periodically. In its meeting held on 24th November 1972, the Court of the Forest Research Institute and Colleges, Dehra Dun (the representative high-powered body for guiding and supervising the working of the Institute) decided to abolish the Board, and instead it accepted, on the basis of discussions between the Inspector General of Forests, the President of the FRI, Chief Conservators of Forests and representatives of wood-based industries, a procedure of research identification and evaluation, outlined below.

2.8 Briefly speaking, two Conferences were to be organised at 5 years intervals, one on forestry and forest biology and the other on forest products. The purpose of each Conference would be to indicate the areas in which research should be initiated and intensified. For each particular field of research, there should be a Panel comprising scientists and technologists active in that field and also workers in corresponding or allied fields in sister institutions. The Panel would review the current programmes for each branch of the FRI and recommend programmes and projects for consideration of the Research Councils of the Institute. There would be two such Councils—one dealing with forestry and forest biology and the other with utilisation. The composition of these Research Councils, which would be the main guiding and evaluating agencies, were to be broad-based. These proposals have yet to be implemented.

2.9 A review of the working of the present agencies employed in forest research reveals one striking fact, viz. that forest research activities in India are restricted to a very small number of institutions and that besides the FRI under the Central Government there is hardly any organised forest research elsewhere. Recently, Madhya Pradesh, Maharashtra and Uttar Pradesh have established Forest Research Laboratories in their respective States, mainly for tackling local problems largely of a routine nature. Most of the States are engaged in field-oriented research, especially in silviculture, but are not at all equipped to deal with the problems and prospects of research in the field of forest products. A list of research institutions in the public and private sectors engaged in forest research is given in Appendix IV.

2.10 It is also known that while industrial development is proceeding fast, the production of raw material for industries is not keeping pace with it and severe shortages are already being felt. Research efforts to achieve increased production of raw materials and their economic utilisation are not being made in a concerted manner, either at the Forest Research Institute or in the States. There is also very little research on factors influencing forest product consumption in India. Comprehensive facilities for research in some of the disciplines, including forest management, economics, ecology, etc., are yet to be built up.

Lack of Forest Research at the University Level

2.11 Unlike agriculture, research in forest science is hardly carried out in the universities in this country and barring some ecological research at a few centres, no university is conducting any research bearing on forestry. There has been no fruitful cooperation established between the State forest departments and the Agricultural Universities.

Forest Education

2.12 Due to State ownership of the bulk of forests, forest education has perforce been confined to the limited personnel of the forest departments. This in-service* education and training is imparted to the following four categories, viz. (i) Officers for the higher Services, (ii) Forest Rangers, (iii) Deputy Rangers/Foresters, and (iv) Forest Guards.

2.13 In-service training and education for the higher Services, comprising members of the Indian Forest Service (IFS) and those of the State Forest Services, and for the Forest Rangers are imparted by the Indian Forest College, Dehra Dun and two Forest Rangers' Colleges located at Coimbatore and Dehra Dun under the overall control of the Forest Research Institute and Colleges, Dehra Dun.

2.14 The Indian Forest College as well as the two Forest Rangers' Colleges are administered by the Central Government. The President of the Forest Research Institute and Colleges, Dehra Dun is responsible for looking after the training and education. There is a Director of Forest Education to assist the President in these functions. For all the training and education courses run by the Forest Research Institute and Colleges, Dehra Dun, the FAO recognises it as a training Centre for the South East Asia Region.

2.15 The Dean of the Indian Forest College looks after the in-service education and training of the officers in the IFS and the State Forest Services. At present, classes for these two courses are being held together, because of the lack of adequate number of instructors. In addition, the Indian Forest College is reponsible for holding the six month refreshers' course for the officers in the State Forest Services promoted from the rank of Forest Rangers. There is also a short course on wildlife. There are two Principals, one in each of the two Forest Rangers' Colleges. For the IFS, the Union Public Service Commission selects the candidates through an all-India competitive examination. The selected candidates undergo in-service training for two years at the Indian Forest College, and are awarded the Associate of Indian Forest College. (AIFC) Diploma on the successful completion of the course. They are required to take up a dissertation on a particular subject, as a part of the in-service training and education. As this is not tied to any specific field problem, it ends up mainly in looking up references for essay writing. They also undergo a Foundation Training Course of 4 months at the National Academy of Administration, Mussoorie, with the Administrative and Police Service Probationers (IAS & IPS). The students for the State Forest Service course are recruited by the different States and sent to the Indian Forest College, Dehra Dun, as stipendiary students for the two year course. They are also awarded the AIFC Diploma on successful completion of the course. Similarly, Forest Rangers are also recruited by the States and sent to the Forest Rangers' Colleges as stipendiary students for a two year course. They are awarded Certificates on successful completion of the course.

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*This includes pre-service education and training also.

2.16 The present staffing pattern is inflexible and one lecturer/instructor is sanctioned only on the basis of a certain number of students. The lecturers/instructors are brought on deputation from the States. The deputations are generally on a short term basis, decided on seniority and record, without much regard to aptitude for teaching. It has been found that there are frequent delays in going through the formalities of getting a lecturer/instructor on deputation. Very often States are reluctant to spare their best talents. Moreover, one lecturer/instructor has to teach a number of subjects, in some of which he may have little or no interest. There is no scope or facilities for a teacher to carry out research. Similarly, except in a few subjects, there is no institutional arrangement by which a research worker can freshen his mind by devoting part of his time to teaching.

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2.17 In the syllabus for the in-service education and training for the various levels, three aspects of forest education are covered, namely:

(1) Conservation, protection and management of the forests;

(2) Harvesting; and

(3) Utilisation.

Since harvesting is, by and large, done by the contractors and utilisation is in the hands of the private industry, the syllabus for the in-service training is heavily tilted towards conservation, protection and management of forests. The syllabus also does not have scope for specialisation in various aspects of forestry.

2.18 In addition to the courses run by the Indian Forest College and the two Forest Rangers' Colleges, the Forest Research Institute, Dehra Dun, offers training facilities for the following courses of study and training:—

(a) Silvicultural Research and Statistical Training.

(b) Short course in Soil Science.

(c) Short course in Use of Forest Hydrological and Climatological Instruments.

(d) Use of Basic Tools and Modern Logging Equipments and Methods.

(e) Extension course in Forest Botany and Forest Entomology.

(f) Advance Diploma course in Pulp and Paper Technology, and

(g) Advance Diploma and Certificate course in Seasoning and Preservation of Timber.

2.19 State forest departments also avail of the training courses for forest officers at various levels, conducted by the Indian Council of Agricultural Research for soil conservation and by the Indian Photo-Interpretation Institute, Dehra Dun, for specialised studies in photo-grammametry, and photo-interpretation of aerial maps, etc. The FRI continues to offer followships for post-graduate and doctorate studies in forestry and allied subjects for university students.

Technical and Vocational Training in the States

2.20 In the States, training is usually imparted in forest schools to what are called Deputy Rangers/Foresters and in a few States, there are schools for training Forest Guards. The Deputy Rangers/Foresters are trained to help the sub-professional and professional forestry personnel in executing their functions. They mostly get on-the-job training to enable them to carry on their functions satisfactorily. But in all the States the capacity of these schools to train the Deputy Rangers/Foresters is severely limited, and supply of trained Deputy Rangers/Foresters had always lagged behind demand. Most States have not even been able to create facilities for training of Forest Guards.

Investment in Research and Education

2.21 One of the constraints for developing a dynamic forestry practice in India has been the inadequacy of funds for forest research. Compared to many countries, the input available for research is too low in India, as the following Table will show:

TABLE 1

Expenditure per Hectare on Forest research in Relation to Total Forestry Expenditure in a Few Selected Countries

Name of the country	Forestry expenditure per ha of forest area in U.S.$	Expenditure on Forest Research as percentage of col. 2	Calculated Forest Research expenditure in U.S.$ per ha.
1	2	3	4
Israel (1971)	91·0	1·5	1·36
Japan (1971)	25·4	2·8	0·71
Korea (1970)	13·8	8·2	1·13
U.K. (1971)	29·2	5·0	1·46
New Zealand (1970-71) ..	1·3	35·0	0·45
India (1970-71)	1·2	2·4	0·03

Source: Compiled from 'Status of Forestry Research Activities in Asia (excluding USSR)'—by Shri S.K. Seth, President, F.R.I. & Colleges, Dehra Dun—Article contributed to Seventh World Forestry Congress, 1972.

SECTION III

NEW ORIENTATION IN FOREST RESEARCH

3.1 Forest technology in the field of forest management and forest utilisation is changing fast, both in India and elsewhere. In view of the demand on forest departments for production forestry and social forestry, the research organisations would be called upon to deal with many new problems not thought of before. Accordingly, research will gradually become more varied and exacting.

3.2 The forestry personnel will have to play a dynamic role in the task of identifying and transferring relevant elements of technology and information derived from research to the field and *vice versa.* The link will be weak, if the teachers responsible for the education of forestry personnel do not have the facilities to keep themselves in continuous communication with the progress of forest research and its application in the field. A research worker likewise must participate as often as possible in teaching to freshen his mind and to share with the students his experience of research. Moreover, there should be institutional arrangements by means of which research results are ensured rapid application.

3.3 It is recognised that forest research base is currently very inadequate leading to accumulation of large number of basic and applied problems of conservation and development of existing resources. In order to make forest research more effective, and particularly to make the production and social forestry succeed, the existing research base both at the Centre as well as in the States needs to be completely reorganised and augmented. We agree with the views expressed by the Second Expert Committee that in the past, research programmes have been too diluted, and activities were attempted in many spheres which could not be of immediate benefit to the forest departments of the States. What is true for the Forest Research Institute (FRI), Dehra Dun holds equally for forest research in the regional centres and the States.

3.4 To make forest research more purpose-oriented, reorganisation should be initiated within a changed institutional framework. Future forest research should be first regrouped. Within each group there should be a proper selection of research problems adjudged in the light of their contribution to forest management, servicing of forestry practices and development of forest-based industries. This will require an appreciation of the precise demands for forest research in each discipline. According to the affinity of the problems, three broad groups* may be recognised, namely, forestry and biological research, industrial and utilisation research, and forest management and operations research.

3.5 Within each group, there would be some research which would be basic to increase the stock of knowledge and also to provide the essential information for its use in an applied programme. Some items of basic research bearing on forests are: physiology of plant nutrition, consumptive use of water by different species, mineral cycling in forest ecosystems, permeability and diffusion phenomena in wood, chemical structure of lignin, hemicelluloses etc., population dynamics of forest stands, etc. Forest research, by and large, would be of applied nature, for example, choice of a tropical pine in a particular bio-climate, economics of local plantation techniques, economic harvesting of products, industrial utilisation of secondary species etc. The current applied research problems in each of the groups mentioned in the previous paragraph are discussed in the following paragraphs.

Forestry and Biological Research

3.6 The main objectives of research in forestry and forest biology would be to discover ways to improve production from all types of forest land as fast as possible, and to extract the maximum amount of produce from both natural forests and plantations. Future plantation strategies, selection of species, techniques of afforestation, fertilisation of plantations, and control of diseases and pests are some of the urgent silvicultural and biological problems that need to be tackled. Clear priorities must be established for these items, and the responsibilities for each agency spelt out. Broadly, the forestry and biological research should cover the following fields:

- (i) Silviculture
  - (a) Plant introduction,
  - (b) Seed testing and experimental silviculture,
  - (c) Documentation,
  - (d) General.

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*Disciplines covered by the groups are detailed in paragraphs 3·6, 3·1 and 3·11.

(ii) Silvics—
    (a) Physiology,
    (b) Forest influences.
(iii) Ecology, including wildlife.
(iv) Forest Soils—
    (a) Soil chemistry,
    (b) Soil physics,
    (c) Petrology.
(v) Forest genetics and tree breeding,
(vi) Social forestry,
(vii) Forest entomology,
(viii) Forest pathology,
(ix) Systematic botany,
(x) Wood anatomy.

Industrial and Utilisation Research

3.7 Industrial research will have to proceed in stages. The laboratory results will first have to be transferred to a pilot plant and then into industrial design and its feasibility and economics worked out before the results can be utilised by industries for production. Industrial research will have to include the developmental and/or the pilot plant stage if practical benefit is to flow from it. Industry has not been in a position to appreciate and take full advantage of the ultimate benefits of research activities because of lack of adequate facilities to translate results of laboratory and small-scale trials into large-scale adaptation and exploitation. This gap is primarily in the field of development of technology, pilot trials, project surveys, cost analysis and assurance of positive economy in the future development of research achievement. Some working arrangement may have to be made so that pilot experiments, which are proved, can be transferred to industrial designs. We feel that the future industrial research may be oriented to this new concept in order to achieve adequate transfer of technology.

of seasoning kilns, fire retarding compositions, economic chemical products from forest resources, different types of paper and paper products, rational utilisation of secondary tree species, highly developed timber engineering techniques have largely remained confined to the laboratories or demonstration units only, without yielding commensurate benefits to the nation. Success of production forestry would depend on complementary utilisation and industrial research.

3.9 The rapid industrial growth in the country together with the severe restriction on imports, shortage of foreign exchange and the oil crisis have suddenly increased the importance and urgency of research in wood technology, wood distillation, timber engineering, cellulose pulp and paper manufacture, collection, cultivation and chemistry of minor forest products and in general the entire area of utilisation of forest produce. Better use of the forest products available would also have to be made in order to tide over the twenty to forty year gap between the planting programmes taken up for raising productivity and the full yield thereof.

3.10 Broadly, the industrial and utilisation research should cover the following fields:—

(i) Cellulose and paper.
(ii) Chemistry of forest products.
(iii) Timber mechanics.
(iv) Timber engineering.
(v) Composite wood and panel products.
(vi) Wood working and sawmilling.
(vii) Wood seasoning.
(viii) Wood preservation.
(ix) Minor Forest Products—Collection, harvesting and utilisation.
(x) Industrial design.

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Forest Management and Operations Research

3.11 Forest management and operations, including forest statistics, forest economics and marketing, which are distinct disciplines of research may be grouped together. There is at present little appreciation of the factors influencing forest product consumption in India. There is a real need for an objective assessment of wood requirement. The study of demand and supply relationship of forest products is essential. Economic development would demand more efficient and less wasteful methods of extraction and conversion. Forest production, including harvesting, marketing, forest utilisation and general forest development will require concerted efforts, keeping an eye on the economics of the whole process. This research is not being conducted at present and should be started forthwith. In our Interim Report on 'Production Forestry—Man-made Forests', we have recommended a massive commercial forestry programme to be financed by institutional agencies. This will require preparation of projects, for which States will require basic data on prices, markets and other economic parameters. The establishment of a wing at the Centre for marketing and statistical research is, therefore, vitally necessary for the future success of the forestry development programmes. In the State too steps should be taken to set up similar wings to perform similar functions. Broadly, research on forest management and operations should cover the following fields:

(i) Management and mensuration,
(ii) Marketing of forest products,
(iii) Logging,
(iv) Forest Economics,
(v) Forest Statistics.

3.12 The Commission recommends that in order to be more effective, forest research should be re-grouped as follows:—

(a) Forestry and Biological Research;
(b) Industrial and Utilisation Research; and
(c) Forest Management and Operations Research, including statistics, economics and marketing research.

Forest research should be organised at three levels—State, regional and national. Some expertise has already been built up in the Forest Services either through long association of forestry personnel with research in some of the disciplines or through their individual efforts in acquiring special knowledge. In the re-organisation of research, experience and specialised knowledge of these forestry personnel would help in giving forest research a good start. Accordingly, the in-built specialisation that exists at present in the Forest Services should be taken advantage of.

Research at the State Level

3.13 With the implementation of a massive programme of man-made forests, as recommended by the Commission in its Interim Report on Production Forestry—Man-made Forests and of the programme of farm forestry and extension forestry, as recommended in its Interim Report on Social Forestry, the States will come across a host of problems in all fields of forest research. Forest being a State subject, the State Governments have the facilities of forest lands at their disposal for carrying out field-oriented research. At present the organisations existing at the State level are insufficient for carrying out forest research. They have to be built up gradually to an adequate level, so that ever-increasing problems associated with forests can be easily tackled. Facilities required to carry out basic and applied research bearing on forest may be built up in the agricultural universities. Other universities may also organise research on forest problems to the extent feasible and possible. For this purpose, the State forest departments should provide the necessary facilities and support.

3.14 We have already pointed out in paragraph 2.11 that there is at present hardly any university which is carrying out research in forest sciences. No attempts have been made in this direction by the Forest Services in the States, so as to utilise the expertise and the facilities available in the universities. The Vice-Chancellors of most of the Agricultural Universities, whom we consulted, are willing to carry out joint research programme with the Centre and the State forest departments. Forest research would be enriched, if the facilities and expertise available in the Agricultural Universities are fully utilised to support the research needs in the States. Other universities can also undertake complementary research in collaboration with the Central and State organisations in such fields as botany, zoology, pathology, hydrology, economics, etc.

3.15 The most significant role that the universities can play is with regard to basic research, referred to in paragraph 3.5 above. It must be realised that a certain amount of basic forest research is not only desirable, but inescapable in order to produce a secure scientific foundation to applied research as well as to create conditions favourable to the application of results on a large scale in the shape of applied research. Some basic researches have been carried out at the FRI and its regional centres. Some examples are: fibre and other anatomical characters in relation to wood properties, stress-strain relationships in anistropic media like wood, life cycle studies of fungus and insects, etc. The FRI has the promise of being developed as a centre of basic research considering its experience, expertise and tradition. The academic climate of universities, however, is always most congenial to the pursuit of knowledge for its own sake and hence the involvement of the universities in respect of basic research would be most useful.

3.16 The universities could take part in applied research also as joint programme with the Central and State forest research organisations. For this purpose, it may be expedient to have research workers with knowledge of forestry. While recognising the fact that forest research (and related education) can be developed in the universities in the manner they would prefer, it must be pointed out that at the initial stages at least, cooperation and collaboration of the Inspector General of Forests, Forest Research Institute, Dehra Dun and the State forest departments should be not only worthwhile, but also essential. The matter concerning forest education in the universities is dealt with in Section IV, and the institutional arrangements and funding in Sections VI, VII and VIII.

3.17 As regards the State forest departments, we feel that they should confine themselves primarily to applied research of a local nature in the fields of forestry, forest biology and forest management, but consistent with the development policy of the country as a whole. In other fields of research, such as utilisation, harvesting, economics, marketing etc., the State forest departments may act in coordination and collaboration with the universities and the Central forest research organisations. The State Governments may, if necessary, establish properly equipped and staffed research institutes for the purpose, keeping in view the size of the State forests, the complexities of their problems and the prospects of their development. But a State institute should not conjure up the vision of spacious buildings, elaborate laboratories and lots of research workers and staff. Actually, though the term 'institute' is used, it should have only a limited number of branches or disciplines, depending on the state of forest development, the forest resources and the availability of expertise in the particular State. Such institutes should work in close collaboration with the Central forest research organisations and the universities.

3.18 The State forest departments will also have to undertake adaptive research in connection with social forestry, particularly farm forestry and extension forestry, in the same manner as in agriculture as recommended in our Interim Report on Some Aspects of Agricultural Research, Extension and Training.

Research at the Regional and National Levels

3.19 In addition to taking up basic research bearing on forest through the Central forest research institutes, the Centre should also shoulder responsibilities of applied research of regional and national importance, besides the coordination and collaboration in the fields specified in paragraph 3.17. The States will be the source of all primary data and research materials for the purpose of coordination and collaboration. The industrial research, which requires a large capital investment and special expertise and equipment, would have to be the responsibility of the Centre, as the States may not be in a position to mobilise the resources for such research. Even in subjects taken up by the States, which might be establishing 'institutes', they may not be in a position to provide outlay and expertise for such applied problems as are of long term nature, for instance, Sandal spike disease, introduction of tropical pines, control of hot and cold deserts, disease in Eucalyptus plantations, etc. In order to attain adequate standard in research, the Centre may also have to take upon itself the responsibility of carrying out applied research of a local nature in the States having smaller forest resource, which would be unable to establish proper research base or find difficulty in developing the right kind of personnel for conducting forest research.

3.20 So far, the Central responsibility for forest research has devolved only on the Forest Research Institute, Dehra Dun with the regional research centres always looking up to the FRI for guidance. This has not been conducive to a healthy growth of research in all the centres. Moreover, in view of the bio-climatic diversity in India, and also in the attendant silvicultural, utilisation and management problems, dependence on one institute for organising research is likely to bring in ultimately diminishing returns. There will be many problems in research, which the forest departments will face for the first time, in the fields of utilisation, forest biology, forestry, marketing, export etc. and a large number of them will be of long term nature. Some of them may be common to two or more geographically contiguous States. To deal with such problems, the Central Government may have to set up research institutes/centres in different regions of the country with definite functions assigned to them. Accordingly the number of disciplines or branches to be covered by each institute/ centre will vary. Dividing India into regions* for forestry purposes has already been adopted in constituting the Central Forestry Commission, and while establishing regional forest research institutes, the same division into regions may be adopted. Compared to all the regional centres which exist now and the institutes/centres which are likely to be established in future, the Forest Research Institute, Dehra Dun, by virtue of its vast research base covering a large number of disciplines and its pioneering role in the field of forest research in the country, will always occupy a premier position and should continue to enjoy the status of a National Institute.

3.21 Regarding division of responsibility for research between the Centre and the States, we are suggesting the same pattern as it prevails in the case of agricultural research in India. The major part of research efforts in agriculture is sponsored and financed by the Centre, even though agriculture is a State subject. For example, in the Fourth Plan, the outlay for the Central programmes sponsored by the Indian Council of Agricultural Research is about 74 per cent of the total public sector outlay on agricultural research and education.

3.22 In the field of forest research, a parallel may be drawn with the structure of research organisations in Canada and Australia. In Canada the forests are owned by the different provinces but about 75 percent of total expenditure on forestry research is federal. The Department of Environment, which includes forestry, in the Federal Government is responsible for most of it and forest research is an obligatory responsibility of the Canadian Forestry Service (CFS) under the Federal Government. For this purpose, the CFS runs a number of regional research centres and institutes. The Federal Government may also enter into agreement with the provinces, and through the CFS, conduct forestry education or research related to forest protection and forest management or forest utilisation. In Australia, where too the control of the forest remains with the individual States, the Forestry and Timber Bureau under the Ministry of National Development in the Commonwealth Government has almost exclusive responsibility of forest research. For this purpose, the Bureau runs the Forest Research Institute, with various units such as silviculture, forest management and forest protection research, and regional experimental stations.

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*Government of India, Ministry of Food & Agriculture (Department of Agriculture) Notification No. 7-3/71-FSC dated 19-5-72 specifies the following regions:—

(a) ***Eastern Region*** : **Assam, Meghalaya, West Bengal, Bihar, Nagaland, Orissa, Manipur**, Tripura and Centrally administred areas of Arunachal **Pradesh**, Mizoram and Andaman & Nicobar Islands.

(b) *Northern Region* : Uttar Pradesh, Haryana, **Punjab**, Himachal Pradesh, Jammu & Kashmir, and Centrally administered areas of Delhi and Chandigarh.

(c) *Western Region* : Gujarat, Maharashtra, Rajasthan, Madhya Pradesh, and Centrally administered areas of Goa, Daman and Diu and Dadra **and Nagar Haveli.**

(d) *Southern Region* : Tamil Nadu, Mysore, Kerala and Andhra Pradesh.

3.23 In the light of the facts stated above, the Commission recommends that the responsibility for carrying out basic and applied research by the Centre should be dischrged in the manner specified in paragraph 3.19. However, the industrial research should also include studies on the developmental and/or the pilot plant stage in the institutes/centres carrying out such research. There should be a well organised unit of industrial design, which would expedite commercial exploitation of proven pilot experiments.

3.24 The Commission also recommends that the Central Government should set up, where necessary, multidisciplinary regional forest research institutes as part of its research responsibilities. In addition, there might be centres to take up specific problem-oriented research projects.

3.25 During the course of implementation of forest development programmes, problems of an allied nature may arise, which would require the concerted attention of research workers of many disciplines, including forestry. One such problem is that of forest soils. The productivity and, therefore, all development programmes in forestry will be dependent on the scientific knowledge of the basic resources, of which soil is an important one. Forests grow under a wide range of soil conditions and the production varies with these conditions. Therefore, before forest land can be managed according to its capability, the forest lands have to be classified into capability classes. The study of forest soils should be taken up on a much more extensive scale than what is being done at present. This is not possible within the present framework under which there is only one branch dealing with forest soils in the FRI, Dehra Dun under the Director of Forestry Research. Some States have taken up the study, which however mainly depends on personal initiative and on the availability of proper expertise in the forest departments. A systematic study is hardly possible under the present set-up. Forest soil has certain characteristics which have to be properly studied. More particularly, the study should aim at delineation of forest soils, which can be utilised by the forest departments for their maximum productivity. The survey of forest soils should be one of the activities of the State forest research organisations. However, a collaboration with the All India Soil and Land Use Survey Organisation would be necessary. This is because of the availability of trained personnel in this organisation for soil survey in general, and also due to the fact that soil survey, in whatever sector it may be, should be carried out by means of uniform and standard procedures throughout the country. The State forest soil survey organisations should also coordinate with the State Coordination Committees and the Central forest research organisations for soil survey in the matter of survey of forest soils.

3.26 Examples of other problems, which require similar concerted attention of research workers of allied disciplines, are: nature of Sandal spike disease and its cure, regeneration of high level conifers, introduction of tropical pines, afforestation and grassland improvement in cold and hot deserts etc.

Role of Forest-based Industries and State Corporations

3.27 The main responsibility of research on industrial utilisation of forests and forest products should lie with the Central Government i.e. the FRI and the regional institutes/centres, but the forest-based industries on their part cannot keep out of R&D efforts. It was found in USA that from 1952 to 1956 inclusive, private industry supplied on the average 42 per cent of all R&D funds, government 56 per cent and nonprofit institutions 2 per cent. The private firms also paid to Government and non-profit institutions to do research for them. In 1953, expenditure on R&D from the companies' own funds in USA amounted to about 0.9 per cent of sales. No statistical data for India in this respect are available. The Second Expert Committee emphasised the role of the forest-based industries in formulating programmes for applied research on forest products which should be intended for commercialisation. The Committee observed that the FRI should embark upon major pilot plant research only when a substantial portion of the expenditure is borne by a private or public sector industry.

3.28 The Commission has already recommended the setting up of Forest Corporations to implement the programmes outlined in its Interim Report on Production Forestry—Man-made Forests. The Corporations will face the problems, like selection of species with reference to site, procurement of quality seeds, Pathology, improvement of technique for faster rate of growth, etc., for which researches will have to be undertaken. The Commission, therefore, recommends that the Forest Corporations and the forest-based industries should have their own research sections but depending upon the nature and complexities of the problems, they may refer the same, and simultaneously extend financial support, to the Central and State research organisations or universities.

'Development' in R&D in Forestry

3.29 It is recognised that an R&D infrastructure by way of scientific and technical education, research and development facilities, marketing and management expertise is essential to translate results of research into successful production efforts in the field. We have so far discussed the research concepts in general and research and development for industrial and utilisation in particular. We shall deal with the scientific and technical education in the next Section. It is, however, seen that in general there is a considerable gap between research and its development and transfer to forestry practices in the field. In Agriculture, this gap is sought to be bridged with the help of extension. In an earlier Report*, we have stated that extension is not just carrying the improved practices as they are to farmers for adoption; it is mainly activisation of farmers' intelligence to such an extent that they understand the principle behind each recommendation so as to enable them to make adjustments necessary for adoption under their conditions. Strictly speaking, extension as envisaged above may not be required in forestry, forest biology, forest management and

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Interim Report of the National Commission on Agriculture on 'Some Aspects of Agricultural Research Extension and Training,' November, 1971—paragraph 7.8.

operations, where Central and State research organisations are concerned, since the major part of the innovation and application of new technology would necessarily have to be done on Government forests, as almost the entire forest lands in the country are owned by Government. The problem of 'development' should, therefore, aptly be considered as arising from that of transfer of technology from research institutes to the field personnel.

3.30 So far as State forests are concerned, the repository of research knowledge in a State will be the State forest department itself. But that assumes that the communication between regional and national research institutes/centres, State research institutes and practising forestry personnel flows evenly. It is only when such flow of communication takes place that wider application of the improved technology in forest management can be properly guided and actively pursued. Research does not then become an end in itself.

3.31 This require a sustained effort in development. The Commission, therefore, recommends that for the purpose of dissemination of research results and keeping track of their application in the field, there should be Development Officers having the appropriate background in the Central and State research institutes/centres. Their functions should be to assist the heads of institutes/centres and research workers by feeding them with information etc. about progress in the application of research and to furnish the practising forestry personnel in the field and the forest-based industries with new research knowledge.

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SECTION IV

REORIENTATION OF FOREST EDUCATION

4.1 In-service forest education and training in India is a Central responsibility and is imparted to a few categories of selected forestry personnel, namely those of the Indian Forest Service, State Forest Services and the Forest Rangers. The Indian Forest College, Dehra Dun, undertakes the education of the officers in the higher Services, viz., Indian Forest Service and the State Forest Services. The education at this level is the only professional one in forestry available in India at present. The education of the Forest Rangers, at sub-professional level at present, is conducted in the Forest Rangers' Colleges, one each at Dehra Dun and Coimbatore.

4.2 All the colleges for the in-service forest education are administered by the Forest Research Institute and Colleges, Dehra Dun. The colleges are located in the same premises as the Forest Research Institute, Dehra Dun and its centres, so that full advantage can be had of teaching by research workers in specialised subjects, and of research laboratories and libraries. But this arrangement has not succeeded in fully developing the desired link between education and research. The horizon of research in every field of forestry, silviculture, management, utilisation, forest-based industry, wildlife, etc. is expanding, and this should be utilised to widen the knowledge of the trainees. Therefore, there should be a closer institutional link between research workers and teachers. New concepts of planning and management and the goals of social forestry would require specialists, for which the in-service training should lay the foundation. Time has, therefore, come to widen the coverage of forest education by (a) broadening the scope of in-service training at the Forest Research Institute and Colleges, and (b) associating the universities.

Role of Universities in Forest Education

4.3 In all branches of science the universities play a vital role in the conduct of education, but in the case of forest education the universities have not come forward, except the Universities of Calicut and Himachal Pradesh in the recent past. The University of Calicut started a four-year professional Degree course in forestry leading to B. Tech (Forestry). The first batch of students passed out in December, 1973. The University of Himachal Pradesh has established recently a department of forestry, and a forestry course has been included in the curriculum. It may be mentioned that the course content of the in-service forest education for the higher Forest Services in the forest colleges at present is such that it can compare favourably with that of forest education in the universities elsewhere. The scope of forest education in India has been linked till recently with the limited career opportunities, the only avenues of employment being what are required for the management of Government forests. One school of thought, however, is that in future the demand for forestry graduates will increase, because a time may soon come when it will no longer be necessary for agriculture to occupy so much land, and the land released from other uses would have to be devoted to forestry or similar purposes, as is happening in some of the developed countries in the world. If forest education is thrown open to the academic atmosphere of the universities, perhaps the importance and relevance of forestry to human well-being may come to be widely and properly understood, not only by those directly studying it, but also by others with whom they will come in contact. Thus the advantages that could accrue are, amongst others: (a) to establish a stronger foundation for forest science in India; (b) to disseminate the knowledge of forestry over a wide circle; and (c) to create a condition for growth of local opinion in favour of forestry.

4.4 No university in any country in the world, including India, can ignore the career prospects of students, even while making an academic pursuit of knowledge. For most of the students, university education is a step towards better career in their chosen branch of studies. Forest education at the universities would, therefore, have to be broad-based at the undergraduate level, so that a wide choice of career is possible. The emphasis in the curriculum should be equally on theoretical knowledge and its practical application in the areas specially relevant to the country as a whole or the region concerned. These areas should be identified by studies of the national economy and national development plans, and a careful assessment of the technical manpower required should be made to serve as guidelines for the universities imparting forest education courses. The responsibility for the study and assessment mentioned above should lie with the organisation mentioned later in Section VI.

4.5 In this connection, the recent changes made in the pattern of forest education in the universities in the United Kingdom may be quoted. In the early days, training and education of the officers in the Indian Forest Service were imparted at the Forest College at Coopers' Hill, United Kingdom, from 1885 to 1905. The Coopers' Hill College was closed down in 1905; after which the universities of Oxford, Cambridge and Edinburgh became the training centres for the probationers of the Indian Forest Service. Each of these universities ran a forestry school and used to award Bachelor's Degree in Forestry to the successful candidates. Besides the probationers of the Forest Services in the Commonwealth, the opportunities of forest education were open to all. In 1928, the training of probationers of the Indian Forest Service was shifted to the Forest Research Institute and Colleges, Dehra Dun. The demand for training forestry personnel in the U.K. from other British Territories also diminished as and when the latter became independent.

4.6 The University of Oxford has lately devised an Honours course which leads to B.A. Degree in 'Agricultural and Forest Sciences'. This has been designed to facilitate wide choice of careers, for instance, in teaching, industry, planning or local governments rather than follow a vocation in agriculture or forestry. For those contemplating a career in forestry, the post-graduate M.Sc. course in 'Forestry and its Relation to Land Management' has been designed. Similarly, the University of Edinburgh now conducts a course leading to both the Ordinary Degree and the Honours Degree of Bachelor of Science in 'Ecological Science', the syllabus of which covers basic sciences, ecology, economics etc. besides forestry. The University of Cambridge offers at present an undergraduate course leading to a B.A. Degree in 'Land Economy'. There is a primary examination, generally in the second year, in which there is a paper on 'The Organisation of Agriculture and Forestry'. The graduates have a wide choice of professional callings, such as a surveyor who evaluates and manages land and natural resources; as a town and country planner; as an agricultural economist or development economist responsible for the economic planning and management of agricultural, forestry and other development enterprises. There are, however, two universities in the U.K., viz. Aberdeen and North Wales (Bangor), which are still running courses for a Degree in Forestry. The details of the courses etc. concerning forestry at present followed in the universities of Oxford, Edinburgh, Cambridge, Aberdeen and North Wales are given in Appendix V.

4.7 We have already mentioned that a close link is desired between education and research. In our Interim Report on 'Some Aspects of Agricultural Research, Extension and Training', we have outlined the concept of an integrated approach pertaining to teaching, research and extension in every discipline in the universities and research-cum-teaching institutes. It has been stated in that Report that to enable a teacher to do his teaching well, he should positively involve himself in research and likewise a research worker must participate as often as practicable in teaching work in order to freshen his mind and broaden his outlook. University teachers and research workers would have a responsibility to ensure that results of research are transferred to the fields for the purpose of adoption and for this it is imperative that they should have adequate knowledge of extension methodology. In the case of forestry, extension activities of the universities would really consist in keeping abreast of the requirements of the forest departments in the States and hence a close link should be established with the forest departments of the State concerned. We have recommended in the previous Section that the agricultural and other universities should be encouraged to take up basic research and joint applied research programme with the Centre and the State forest research organisations. There should thus be no difficulty in having the three elements of teaching, research and extension pertaining to the discipline of forestry integrated in the universities.

4.8 Since forestry will be a new branch of science in the universities in India, it will take some time before proper facilities of men and materials are built up. Merely starting a forestry department or faculty in a university is not enough. The question of availability of qualified staff and other facilities, needed for research, will also have to be taken into account before introduction of forest education in any university is considered. The universities should, therefore, gradually introduce under-graduate and post-graduate courses and doctoral facilities, so that the forestry personnel in the States can also take advantage of these courses and develop further specialisation. The matter concerning specialisation, however, is dealt with in Section V. Since a base for forest research and teaching is already available for a long time in the Forest Research Institute, Dehra Dun, it is best suited to be easily developed as an academic institution for teaching in forestry both at the under-graduate and the post-graduate levels.

4.9 The Commission, therefore, recommends that the agricultural and other universities, which are to undertake forest research, should, to begin with, include forestry, comprising forest botany and elements of silviculture, forest management, forest utilisation and forest economics, as one of the subjects in the undergraduate course. The syllabus should be carefully drawn up by a National Committee specially appointed for the purpose, and the universities which may start forest education should conform as far as possible to the syllabus so drawn up in the interest of uniformity in forest education in the country. The scope of forest education in these universities should gradually be widened so that graduate, master's and doctorate Degree courses in Forestry can be opened. With the new orientation of forest research recommended by us, the Forest Research Institute, Dehra Dun, should be in a position to organise graduate, master's and doctorate Degree courses in Forestry.

4.10 In order that career opportunities for students taking to forest education are widened, the Commission recommends that the Indian Forest Service (Recruitment) Rules and Regulations should be so modified as to include forestry as one of the elective subjects in the competitive examination for the Indian Forest Service. The States should also give preference to the university graduates in forestry, or with forestry as one of the subjects, in the recruitment of the State Forest Service officers and Forest Rangers, and the candidates so selected must go through the course of in-service training and education at the Forest Research Institute and Colleges.

In-service Training and Education

4.11 In-service training and education for the higher Forest Services, namely, the Indian Forest Service and the State Forest Services, and for the Forest Rangers, should continue to be the exclusive responsibility of the Centre, not only for the sake of uniformity of the standard of education, but also for proper manpower planning. The scope and pattern of in-service training and education would depend on the expectations of the Government from the different Forest Services. The Forest Services are directly concerned with production of goods by the use of forest resource. As such, the States would require their forestry personnel not only well-versed in forest science, but also capable of developing special expertise in many activities concerning the resource management; for instance, inventory, project planning, construction of roads, bridges and buildings, survey etc. Hence, the Forest Services would for a long time to come have to cast their net wide and have in their cadres persons with background of mathematics, economics, engineering, etc. Personnel with these background would have to be imparted a reasonably high level of in-service training and education in forestry, so that cadres are built up with all ingredients to meet the demands of intensive forest resource management.

4.12 Because of the high standard of training available at the Forest Research Institute, the courses for the in-service training and education for the higher Services can be easily adjusted to make them equivalent to the corresponding Degree courses in the universities. Once this is done, either a university could be approached for affiliation of the Indian Forest College, Dehra Dun, as one of its constituent Colleges, like the Indian Veterinary Research Institute and National Dairy Research Institute, or a university or the Inter-University Board approached for recognition of the Associateship of the Indian Forest College as equivalent to an appropriate Degree. This recognition would facilitate further study and specialisation of the forestry personnel trained in India, and they could then be treated at par with their contemporaries trained abroad in comparable fields. But before this is done it would be necessary in this case also to (a) integrate in-service training and education with research, (b) improve the quality of teaching, for which a different personnel policy has to be evolved, as elaborated later in Section IX, and (c) carry out a revision in the system of teaching.

4.13 In order that the teachers in the teaching institutes can do their job well, they will have to keep themselves in continuous communication with the progress of forest research and technological advances in this country as well as in other countries. Hence, they should not only be specialists in respective subjects, but also be actively involved in research work. The research workers will also have to be drawn into the forest education. It will be necessary to create posts of professors, associate and assistant professors in the teaching cadres of all the forest colleges in line with the pattern which obtains in the academic institutions, so that the best talents in the country feel inclined to come as teachers. The existing heads of different directorates of research would have to be given the status of professors and they will have to guide the students regularly through class-room teaching or tutorials. Other research staff should also be appointed associate or assistant professors wherever necessary and feasible. This should not at all be difficult in the case of the FRI, as we have recommended already that the Institute should organise courses for graduate, master's and doctorate Degrees. Similar integration should be attempted in the Central research-cum-teaching institutes imparting in-service training and education to the Forest Rangers. The staff complement should be made flexible to permit the integration. For many disciplines, viz. business management, environmental ecology, forest economics etc. which are necessarily to be taught in view of the changing pattern of forest education, facilities may not be readily available at these institutes. In such cases there should be no hesitation to obtain the services of experts from universities and other institutions for lectures.

4.14 All the personnel in the Indian Forest Service and the State Forest Services would be graduates in one discipline or the other, and many of such entrants will have advanced knowledge in different aspects of biology, engineering, mathematics of mensuration, etc. Accordingly, the teaching for these professional levels cannot be an omnibus one. It must be so recast that a person with advanced knowledge in any subject can concentrate on the field aspects of that subject, and receive greater attention through tutorials in other subjects in which he may be deficient in his academic career prior to entry into the Service. A revision in teaching on these lines was suggested by the Panel of Education in the Forest Research Institute and Colleges, Dehra Dun in 1972. The revision will have to be carried out to its logical end.

4.15 We recommend that the in-service training and education for the Indian Forest Service and the State Forest Services should place mere accent on tutorials in those disciplines, which a student did not have in his university career. Time for tutorials should be made available by reducing the hours of his attendance at classes in subjects in which he has obtained a Degree. However, all students, irrespective of the above arrangements, must pass the examination in all the prescribed subjects.

4.16 The Commission also recommends that the Forest Research Institute and Colleges, Dehra Dun should be the exclusive institution for the in-service training and forest education for officers in the Indian Forest Service and the State Forest Services.

In-service training and education for the Forest Rangers should be imparted at the Rangers Colleges as constituents of the centres where the research facilities for at least the basic subjects exist or can be easily created.

4.17 The Commission further recommends that in some specialised fields, obtaining the services of experts for lectures from universities and other institutions should be resorted to, where necessary. There should also be some bilateral arrangement for exchange of fellowships or professorships between the Forest Research Institute, Dehra Dun and universities and other institutions.

4.18 Dissertation on a specific topic has been introduced as a part of the syllabus for the probationers in the Indian Forest Service. We feel that each individual, receiving in-service training in the higher Services, should be given an opportunity to make advanced studies during the course of training in the line in which he has aptitude, and that this should be done associating him with problem-oriented field projects in the last six months of the training period. The dissertation should be based on such studies.

Training of Deputy Rangers/Foresters and Forest Guards

4.19 The need for the training of the personnel in the grades of Deputy Rangers/Foresters and Forest Guards has been well recognised by the State forest departments. Almost all the States have got forest schools for the training of Deputy Rangers/Foresters, and those that do not have the schools are getting them trained in the forest schools in the neighbouring States. This arrangement is working satisfactorily. In the context of forseeable changes in the forest management, however, it is necessary that the training of the Deputy Rangers/Foresters is not confined only to protection and conservation of the forests. They should be taught about the advances in the fields of silviculture, utilisation, soil conservation, wildlife management, etc. so that these grades of personnel are able to appreciate fully the planning goals. Since the Deputy Rangers/Foresters come into contact mostly with rural population, the knowledge will stand them in good stead in projecting the significance of forestry to the general public. At present the curriculum for the Deputy Rangers/Foresters' training does not go beyond the practical aspect of forestry. A revision should be undertaken, from time to time, of the curriculum in order that it may fit in with the newer expectations from the personnel in these grades. It will be in the best interest of their training, if the research institutes/centres to be set up in the States are located where Deputy Rangers/Foresters' training schools already exist, so that research workers are associated with the teaching of the Deputy Rangers/Foresters. Similarly, the States, where new or additional schools for the Deputy Rangers/Foresters would be started in future, may also consider locating the schools at the same place, where the research institutes/centres are already located. From practical considerations, it may not be always possible to achieve this arrangement. In such cases, the teachers having research experience should be chosen.

4.20 As regards the training of the Forest Guards, it has not been started in all the States. The duties of the Forest Guards can no longer be merely guarding the forests as their designation implies. They are at present being drawn more and more into the responsibilities of execution of different development programmes. In many places, they have also to supervise the day to day operations in nurseries. With the introduction of exotics and improvement in nursery techniques including fertilisation for exotics as well as indigenous species, even the nursery works will require much more than mere common sense. Moreover, due to the socio-economic afflications, destruction of forests is increasing in intensity. To overcome this will require a lot of extension work, in which the Forest Guards have to be a dependable prop. This will also necessitate training of the Forest Guards in extension activities. Accordingly, training schools for the Forest Guards should be opened in all the States either singly or in collaboration with neighbouring States.

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SECTION V

SPECIALISATION IN FORESTRY

5.1 It is to be recognised* that the personnel in the Forest Services have to perform increasingly more specialised tasks because (a) forest lands possess a distinctive character and pose specific and complex technical and managerial requirements, (b) Forest Services, unlike most other Government Services, directly manage a resource which often covers vast areas, and which has a long gestation period, and (c) forestry is primarily a business, the administration of which differs from that of some other Government organisations which merely provide services. The personnel of the Forest Services should be such as to (i) facilitate the integration of forestry development planning with national and regional planning. (ii) ensure coordination of all forestry and forest industries activities, particularly the planning of forest industrial investments and the planning of investments in forestry, and (iii) permit the coordination of forestry and forest industries activities, not only with the physical and recreational services which the forests provide, but also with other land use practices which influence or are influenced by forestry.

5.2 Accordingly, a modern Forest Service should have at its disposal, in addition to forest biologists, which traditionally constituted the bulk of the professional staff, forest economists, forest industrialists, business managers, land managers and of course competent administrators. The demands of modern forestry, with its emphasis on the inter-relationships of various factors of the environment on the one hand, and the necessity for profits on the other, do not permit the traditional biologists to function as they formerly did.

5.3 In the developed countries, consultancy and expertise in the field of forestry are generally available outside the sphere of Forest Services. The same is very often not the case with the developing countries. Therefore, there is a great need to build up expertise within the Forest Services. This will call for creating facilities for specialisation in forest education, in addition to broad general background of in-service training and forest education as at present. There have been some efforts in specialisation by forestry personnel, either through foreign training or through field experience in the States and at the Centre. But these were mainly unplanned efforts and sporadically attempted. There are a number of fields like forest economy, forest soils, forest hydrology, forest pathology, environmental forestry, forest inventory, etc. where specialisation would be of advantage in forest planning and management.

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* A summary of the Revised FAO Study on Forest Policy, Law and Administration by K.F.S. King—Seventh World Forestry Congress, 1972.

5.4 The specialisation in forestry would have to be built up in stages and continued through a person's career. During the in-service training it will be enough if the scheme of education and training is so modified as to create an urge amongst the students to choose a line of specialisation. Our recommendations in paragraph 4.18 were designed towards this end. Facilities for specialisation for the forestry personnel as well as others involved in forest research should be created in the FRI and the universities, which can provide for a higher level of specialisation through M. Sc. courses and doctoral dissertation. The FRI at present grants scholarships to individuals other than forestry personnel for M. Sc. and Ph. D. courses at the Institute, whereas no such facilities are provided to serving forest officers, who may have been continuing field study of a problem associated with forestry without finding an opportunity to be associated with State research organisations, due to administrative or other reasons. In the case of forestry personnel, however, the field of specialisation may be carefully planned, not only from the point of view of their aptitude, but also subject to the required needs of the scientific and technological 'inputs' in specialised fields of forest management and research.

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5.5 The Central Board of Forestry (CBF) in their ninth meeting held in January, 1965 had also recommended that steps should be taken to give opportunities to serving forest officers with necessary aptitude for carrying out research and achieving specialisation. This recommendation has not yet been implemented. The twelfth meeting of the CBF held in May, 1970 again considered it and opined that the proposal for specialisation of forest officers in various branches of forestry should be finalised with the approval of the Court of the Forest Research Institute & Colleges, Dehra Dun. The Commission, therefore, recommends that in addition to continuing and liberalising scholarships for research workers to enable them to take up research at the FRI and instituting scholarships at the universities, supernumerary posts should be created in the FRI, Dehra Dun, and the States should depute their officers to these posts in order that they may continue their line of specialisation or research on approved projects. However, this facility should be available only to such of the officers as have previous record of practical forest management and study of related subject under field conditions in their line of specialisation.

Short-term and Medium-term Technical Courses in Indian Institutes

5.6 There are a number of short-term technical courses run by the FRI, to which references have been made in paragraphs 2.18 and 2.19. The question of introduction of such short-term courses aimed at specialisation of forestry personnel in certain fields, in association with universities or related organisations, has not been properly explored so far. For instance, training in the specialised fields of project planning can probably be arranged in consultation with the Institute of Economic Growth, the Indian Institute of Public Administration, the Institutes of Management, Indian Productivity Council, or even by conducting short courses by some specialists in the Pre-Investment Survey of Forest Resources. In business management also, to build up the specialised managerial cadres of the Corporations or public forest-based industries, the Institutes of Management may be associated with specialised training of forestry personnel. In environmental forestry or ecology, association with an appropriate institution or university will be very fruitful. The Commission recommends that short or medium-term courses in specialised fields should be arranged for the forestry personnel in institutions or universities considered most suitable.

Short-term and Medium-term Study Tours, etc. offered by International Agencies

5.7 For developing the cadre of forest officers and research workers, there are two types of facilities available abroad, which would keep them abreast with the advancements in forest resource management in other countries. Medium-term academic courses, field study tours and orientation courses in different aspects of forestry, generally of 6 to 12 months' duration, are offered by international agencies and/or non-profit organisations like Food and Agriculture Organisation, Economic Commission for Asia and the Far East, Colombo Plan, Ford Foundation, Swedish International Development Agency, Canadian International Development Agency, Danish International Development Agency, etc. Short-term study tours, seminars, workshops, etc. are also often offered by these agencies. In both cases, the Union Ministry of Agriculture sponsors the candidates after consultation with the States/Union Territories. But there is an essential difference between the two types of facilities and different approaches should be followed to utilise these facilities.

5.8 The Commission recommends that the medium-term academic courses, field study tours, orientation courses, etc. available abroad in different aspects of forestry, generally of six to twelve months' duration, should be encouraged as an instrument for improving the cadre of forestry personnel. The aspects cover a large number of subjects from which a proper choice is possible. These offers should be passed on to particular States/Union Territories by the Union Ministry of Agriculture for sponsoring the names of candidates for the training. In doing this, due regard should be paid to the number of personnel already trained in the particular branch of study in the concerned States/Union Territories.

5.9 For the short-term field study tours, seminars, workshops, etc. outside the country, generally of less than 3 months' duration, offered by the agencies referred to above, selection of personnel should be done with much greater care. These study tours, etc. most often deal with advanced thinking on a particular problem and are concerned with highly technical aspects of a particular side of forestry practices or forest research. Such facilities should, therefore, be considered as being more in the nature of opportunities offered for expanding the base of knowledge and breadth of vision of such personnel as have the requisite basic or specialised knowledge or are working in the specialised fields. Unless the selection is done from a restricted field—from amongst persons already identified—benefit of the study tours, seminars, etc. cannot be absorbed substantially by the person concerned. At present the method of selection is a time-consuming process. The States are addressed first for sponsoring candidates and then the selections are made. Very often the States also find it difficult to process the matter quickly. Since all these organisations set a time schedule and follow it rigidly, opportunities for building up expertise are sometimes lost due to the inherent delay. Since the Indian Forest Service has now been revived, this delay can be obviated if all data of in-service training and education, specialisation, basic qualifications, etc. of individual IFS officers and other research workers are maintained in the Union Ministry of Agriculture, along with their service particulars. Once this is done, the Ministry of Agriculture should be in a position to identify the narrow field, from which selection should be made for sponsoring officers for short-term study tours etc., and then seek for the concurrence of the concerned States/Union Territories for deputation. In making the selection, the Central Government should bear in mind the necessity of broadening the base of specialisation evenly in different States/Union Territories. The States/Union Territories should ordinarily have no objection to this procedure, because the benefits would flow to them.

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SECTION VI

DIRECTION AND PROMOTION OF FOREST RESEARCH AND EDUCATION

6.1 The forest research and education programme should be based upon a comprehensive analysis of. long-term needs and consequently on long range planning. There must be an efficient machinery for identification of problems, formulation and effective coordination of research and education programmes and an assessment of technical manpower requirement. In view of the major responsibility of forest research and education devolving on the Central Government, it will be necessary to create a Central coordinating agency. The Central coordinating agency, with the support of the Inspector General of Forests and the State forest departments, would also be able to help the universities to develop their potential for forest research and education. The system of having a Central coordinating agency for forest research and education is also followed in other countries, where, as in India, management of public forests vests completely with the constituent States or Provinces.

6.2 Researches requiring multi-locational experimentation prior to large scale trials have to be decided in the same way as is done in agriculture in the case of coordinated programmes and projects. Coordinated projects in forestry should be based on the following criteria:—

(a) the projects should envisage problem-oriented applied research of known knowledge under different broad bio-climatic conditions;

(b) the problems to be studied should be of national importance and they may belong to a single discipline or may be multi-disciplinary; and

(c) the problems should be such as to warrant the concentration of efforts of a number of research staff on a single problem.

Research problems requiring multi-disciplinary approach may also have to be carried out at more than one centre as a coordinated programme with appropriate arrangements for funds and coordination without the necessity of having the coordinated research projects. One of the important responsibilities of the Central coordinating agency will be to sponsor such programmes and projects. It should locate researchers and institutions most competent to handle the programmes and projects and entrust them with work on a time-bound basis. It is only in this way that duplication of efforts can be avoided and the limited financial resources of the Government put to the optimum use.

6.3 In conformity with the responsibilities of research and education, as outlined in Sections III and IV, the Central Government should have an adequate technical and administrative machinery. The present set-up is unable to cope with even the existing burden and hence a suitable reorganisation has to be thought of. After a careful analysis of, and considerable deliberations on, the entire situation, viz. the present organisational arrangement, the number, quality and orientation of the available personnel, and the added responsibilities consequent on the integration of research, education and extension, as also other responsibilities likely to devolve in future, we have come to the conclusion that a new machinery with specified powers and functions would be most appropriate. Full autonomy for such a machinery for forest research and education may not yet be feasible. A stage of autonomy in undertaking, aiding, promoting and coordinating agricultural education, research and its application in practice has evolved following a good deal of changes in stages in that sector. Integration of education, research and extension with basic concepts of growth in the forestry sector is a difficult task. At this stage, a complete divorce of research and administration in the forestry sector may take forest research further away from the field and education may also lose contacts with research. Research problems will flow from those of the forest departments in the field, since practically all forests are managed by them. For some time to come, it will require a coordination and getting together of all institutions to be involved in the new orientation in forest research and education. A good deal will also depend on the Inspector-General of Forests (IGF) in the Union Ministry of Agriculture, because he will always have the greatest areas of contact with the States and forest-based industries in matters of forest policy, related industrial policy, formulation of Five Year Plans, etc. So the organisation of research may be in the Ministry itself, but this step may be treated as an interim arrangement. Later, forest research and education could also be given suitable autonomy.

6.4 In order to promote forest research and education within the existing administrative structure and in order to achieve the desired degree of coordination between Central and State forest research institutes and universities, we recommend the setting up of a Council of Forest Research and Education (CFRE) in the Union Ministry of Agriculture. The CFRE should have, amongst others, the following functions:

(i) to coordinate, promote, and lay down broad policies of, forest research and education in India;

(ii) to sponsor All-India coordinated research projects and programmes in the field of forestry;

(iii) to evaluate forest research and development in the Central research institutes/centres and the universities, and for this purpose, appoint committees for undertaking research achievement audit every five years;

(iv) to approve syllabi for the in-service training and education of forestry personnel in the Central research-cum-teaching institutes and to review them periodically (while doing so, the CFRE should take into consideration the syllabus on forest education to be drawn up by the National Committee as referred to in paragraph 4.9); and

(v) to have a realistic assessment made of technical manpower, including each category of specialisation, needed at professional levels in forest management, research and industries.

With a view to servicing the CFRE, a chief coordinator having long association with forest research and education should be inducted in the IGF's organisation and given the status of an Additional Inspector-General of Forests.

6.5 The CFRE shall consist of the following:

(i) The Cabinet Minister of Agriculture, Government of India—Chairman.

(ii) The Secretary, Union Ministry of Agriculture (in-charge of Forests—Member.

(iii) The Inspector-General of Forests, Union Ministry of Agriculture—Member.

(iv) The Director-General, Indian Council of Agricultural Research and Secretary, Department of Agricultural Research and Education—Member.

(v) The Director-General, Council of Scientific and Industrial Research—Member.

(vi) The Director-General, Technical Development, Union Ministry of Industrial Development—Member.

(vii) The President, Forest Research Institute and Colleges, Dehra Dun—Member.

(viii) Four Chief Conservators of Forests, one from each Region* by rotation—Members.

(ix) Four research scientists/teachers from universities/forest research organisations—Members.

(x) Two research scientists from outside the forestry discipline—Members.

(xi) Financial Adviser in the Union Ministry of Agriculture—Member.

(xii) Additional Inspector-General of Forests, in-charge of forest research and education in the Union Ministry of Agriculture—Member-Secretary.

6.6 The various disciplines of forest research and education under the CFRE can be conveniently grouped into the following three Wings:—

(a) Forestry, Forest Biology, Forest Management and Operations Researches;

(b) Forest Industrial and Utilisation Researches; and

(c) Forest Education and Training.

Each Wing would be under the charge of a suitably qualified co-ordinator, who could be an officer in the IGF's organisation with the status of Deputy Inspector-General of Forests.

***Vide* paragraph 3.20.

6.7 There should be three Standing Committees, one for each Wing, which would perform the following functions:—

(i) to assist and advise the CFRE in respect of matters pertaining to research and education in their respective sphere;

(ii) to initiate and examine schemes and projects of research and education in their respective sphere;

(iii) to review and coordinate research and education activities in their respective sphere; and

(iv) to perform such other functions as may be assigned to them by the CFRE from time to time.

The coordinators in-charge of each Wing would serve as the Secretaries to the respective Standing Committees, for which members would be drawn on a three year term from various agencies, such as Union Ministries of Agriculture, Education and Social Welfare and Industrial Development, State forest departments, universities, National Laboratories, University Grants Commission, Indian Council of Agricultural Research, Council of Scientific and Industrial Research and forest-based industries.

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SECTION VII

IDENTIFICATION OF PROBLEMS AND FORMULATION OF PROGRAMMES

7.1 In forestry and forest biology, research should discover ways to improve productivity. For this purpose, researches on selection and introduction of species, genetical improvement, production of quality seeds, fertilisation, control of diseases and pests etc., should have priorities.

7.2 The rapid industrial growth in the country together with severe restriction on imports and shortage of foreign exchange has increased the urgency of researches in wood technology, timber engineering, cellulose pulp and paper manufacture, the collection and utilisation of forest products in general. This will require identification of specific research problems in each of these subjects. There should be effective coordination between the CSIR, especially its allied laboratories, and the Central forest research organisations, and also with the forest-based industries. This is in conformity with the recommendations of the Third Reviewing Committee of the CSIR (1964) to the effect that other Government departments should take over partial or complete responsibility for fields with which they are concerned.

7.3 In order to implement the recommendations made in the Interim Reports of the Commission on Production Forestry—Man-made Forests and on Social Forestry, it would be necessary to allocate the responsibilities of collecting basic statistical and economic data and further research in marketing and operations amongst the States, Central organisations and universities. The FRI, Dehra Dun is at present no doubt formulating many time-bound and problem-oriented projects on an all India basis, but as visualised in the Commission's Interim Reports referred to above, the scope is likely to increase much more with particular accent on regional needs.

7.4 The Commission recommends that for identification of research problems, two Technical Committees should be set up by the CFRE for each region (*vide* paragraph 3.20), to be attached to the first two Wings referred to in paragraph 6.6. These Committees should pass on the problems after assessing priorities to the FRI, Dehra Dun, regional and State institutes/centres for formulation of research programmes by Technical Panels, one each for a discipline or a group of allied disciplines. The Technical Panels are to be set up in the FRI, in the regional forest research institutes/centres and the State research institutes by their respective heads.

7.5 On the basis of the research programmes formulated by the Panels, Regional Conferences should be convened for a thorough discussion. All the States, the universities taking up forest research and the forest-based industries in the region should be invited to participate in the Regional Conferences. The recommendations of the Conferences should be available to the Inspector-General of Forests, before the approach for the next Plan is drafted for approval by the CFRE.

7.6 For comparing notes, facilitating exchange of ideas and promoting interaction among researchers, the research workers and others working on the same or related problems should periodically meet in workshops, seminars, symposia, etc. In addition, two Conferences on an All-India basis, one on forestry and forest biology and the other on forest products, should be organised by the CFRE for a critical review of the current research programmes and their achievements in the context of advances made elsewhere. These Conferences should ordinarily coincide with the mid-Plan period.

7.7 The accent in future in all research institutes/centres should be on speedy implementation of research programmes, with suitable powers delegated at all levels. Once the programmes are formulated and approved and allocation of funds is made, the institutes/centres should have full authority for incurring expenditure and undertaking re-appropriation, subject to rules.

7.8 The organisational set-up for, including interrelationships amongst various bodies connected with, forest research and education is shown diagrammatically in Appendix VI.

SECTION VIII

FUNDING FOR RESEARCH AND EDUCATION

8.1 The source of funding for research schemes will be the normal budgets of the Central and State Governments (or committed expenditure), State Plans, and Centrally sponsored schemes and Central sector schemes financed by the Government of India as a part of the development programmes. Some funds will also flow from the Forest Corporations and forest-based industries to the Central and State research organisations and universities, as recommended in paragraph 3.28.

8.2 In the matter of education, the responsibility of the Centre for higher levels of in-service training and forest education will be almost total. As regards finances, as at present the State Governments will bear only a part of the expenses, but the Centre will be responsible for payment of salaries of the teaching staff, and also for buildings, laboratories, libraries, etc. Adequate finances would also have to be provided by the Centre for the teaching staff to take up research in the related disciplines.

8.3 Dynamic forestry practice requires higher expenditure per hectare in inputs, labour and skill. Only a higher investment can yield a net income many times more than what is achieved now. The higher investment will not only mean sizeable addition to the national product, but will automatically provide job opportunities for a large number of skilled and unskilled personnel in the forest areas. However, higher investment will be highly risky without adequate support of research, training and education. Therefore, the inputs for research and education must also be adequate so that the results point to correct technology, and identify the segments for higher investment and produce the technical manpower needed.

Funding in previous Plans

8.4 The following Table shows the allocation and expenditure on forest research and education during the Fourth Plan:

Table 2

Allocation and Expenditure on Forest Research and Education during the Fourth Plan

(Rs. in lakhs)

Sector		Actuals			Fourth Plan 1969-74 Outlay
	1969-70	1970-71	1971-72	Total 1969-72	
1. FRI & Central	14	17	21	52	1,35
2. States & UTs	13	19	44	76	1,80
TOTAL	27	36	65	1,28	3,15

Source : Central Forestry Commission, Union Ministry of Agriculture.

It is seen that the allocation for research and education in the Central and Centrally-sponsored sector forms only about 43% of the total outlay in research and education. It has been calculated that for India as a whole 'well over 80% (of scientific and technological activity) is funded from the Central exchequer'.

8.5 In the matter of allocation of funds for research and education, a greater percentage was made available in the Fourth Plan period than in the previous Plan periods. The total Fourth Plan outlay for forest development was Rs. 92.5 crores, and so the allocation for research and education works out to about 3.3 per cent of the total. During the Third Plan (1961—66) it was only 1.28%, while in the Annual Plans period (1966—69) it was 2.37%. It is quite possible that in the other sectors of production, things may not be much different where direct Government funds are concerned. But it should be remembered that in the other sectors, as for example in agricultural research and education, there are sizeable additional funds available from private or public sources, through private efforts, universities and corporate sector. But in forestry, the entire funding is directly by the Government.

8.6 The National Committee on Science and Technology in its Approach to the Science and Technology Plan (January, 1973) referred to the need for adequate allocation of R&D funds, on considerations of the economic and social importance of the fields*. In forestry and logging, many products are intangible and not quantifiable. Accordingly, value of forest products and services, such as fodder, recreation, watershed protection, etc. does not enter into the contribution of forestry sector to the Gross Domestic Product (GDP). Even without accounting for all these, it is found that in 1970-71, while forestry and logging contributed about 1.6% to the GDP, the Central and State R&D allocation for this sector was about 0.3 to 0.4% of the total.

8.7 There is a case for greater effort in R&D in the forestry sector and of a larger share of the Centre in it. But it is not our point that a mere increase in allocation in all the Plan periods would have automatically led to purposeful research. The inadequate allocation for forest research and education might also have been due to the fact that forestry was not projected as a viable economic and social enterprise. Now that a more dynamic approach to forestry has been suggested by the Commission in its Interim Report on 'Production Forestry—Man-made Forests' and 'Social Forestry', adequate allocation of funds will be essential.

Priorities for Funding

8.8 It is necessary to indicate the priorities for the areas of funding. From what we have discussed in earlier Sections, it would be seen that funding will generally be necessary for the following:—

(i) Establishment of research institutes in States, wherever necessary;

(ii) Establishment of Regional research institutes/centres;

(iii) Addition of disciplines of research in the research-cum-teaching institutes;

(iv) Provision for supernumerary posts and scholarships for research with a view to achieving specialisation;

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*op. cit., page 19.

(v) Conducting short and medium term courses for trai ing in specialised fields either in the forest researc institutes/centres or in the universities or in oth institutes;

(vi) Research-cum-education in universities.

It is, however, difficult to make an accurate assessment of the needs in each sector. It has to be remembered that all these are long term perspectives and not necessarily be confined to any particular Five Year Plan.

8.9 So far as the research institutes in the States are concerned, the structure and size of research institutes will vary considerably from one State to the other, even in States where the need is felt for establishment of such research institutes. Taking an example of the State of West Bengal, there would be two different areas - northern and southern parts—with distinct problems. It should be possible to have a fairly good idea of priorities that are to be accorded in the two areas. For instance, in the northern part, tree breeding and plant introduction may have over-riding importance, along with wildlife and ecological research, whereas for the southern part, the emphasis may be on forest hydrology and the plant-soil relationship. Similarly, wildlife and ecological research for the Sunderbans in the southern part of the State may also be called for. So under the institute, there may have to be 2-3 centres. For States having larger forest areas and a different set of problems the number of centres under the institutes may be more, and the number of disciplines to be covered may be larger.

8.10 The Central research institutes/centres will have to be more elaborately designed. But it is not possible for us at this stage to determine how many such institutes/centres will be needed. The CFRE will be in a position to determine this, after taking into account the availability of right type of personnel for imaginative and purposeful research.

8.11 An idea can be had of the finance required from the identification of schemes made by the Forest, Land and Soil sub-sector of National Resources Sector of the National Committee on Science & Technology (NCST). The sub-sector has identified 140 schemes, out of which 103 are of first priority. If these first priority schemes are executed in full during the next five years, it would require an outlay of roughly Rs. 41.93 crores. Out of these schemes, however, 29 schemes involving financial outlay of about Rs. 15.39 crores have been identified as core schemes. The details of the core schemes are reproduced in Appendix VII.

8.12 The Commission recommends that in the Five Year Plans the total funding for forest research and education should not be less than 1 per cent of forestry and logging sector's contribution to the GDP at current prices. This would amount approximately to Rs. 30 crores in the Fifth Plan. It is reported that personnel of adequate quality and other facilities are available in India to utilise this amount in the Fifth Plan in purposeful research.

8.13 The Commission recommends that a major part of funding for forest research and education should be borne by the Central Government, and it should particularly devolve on the CFRE to fix priorities of schemes for funding. The States should also provide adequate funds for applied research schemes and give priority for the setting up of research institutes in the States, where necessary.

8.14 Forest research would pave the way for a qualitative and quantitative growth in productivity, and this will benefit the Forest Corporations as well as the forest-based industries. The Forest Corporations and the forest-based industries should, therefore, contribute generally to forest research, in addition to what we have recommended for financial support to research institutes or universities on specific problems. There is another base for resource, which cannot be over-looked. At present, the sales of forest produce at the primary stage attract sales tax. It is reasonable to assume that plough back of funds for R&D should also have some direct bearing on the quantum of sales made. One way to link this up would be a levy of a cess or surcharge on sales tax on forest produce at the primary stage.

8.15 The Commission, therefore, recommends that the prospect of levy of an R&D cess on industrial products of Forest Corporations and forest-based industries, besides the finance to be provided by them to research organisations or universities for tackling specific problems, and a cess or surcharge on sales tax on forest produce at the primary stage should be explored as a source of finance for R&D in forestry.

Funding for Research in Universities

8.16 Some amount of finance for research in universities is expected to flow from our recommendations regarding the Forest Corporations and forest-based industries, if and when a specific problem is referred by them. But there may be many programmes of forest research which the CFRE or the State forest departments may have to entrust to the universities, to take full advantage of the facilities and expertise available there. Apart from these, the universities should formulate the research programmes well ahead of each Plan period on the basis of their research needs, and intimate the CFRE about the level of funding required. The demand of funds from the universities should be kept in view, while finalising the outlay on forest research and education.

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SECTION IX

PERSONNEL POLICY FOR RESEARCH AND EDUCATION

9.1 Personnel policy for a research organisation and research-cum-education institute will generally be different from that for an administrative set-up in the field. The 'concept of levels', which characterises the latter, introduces an element of inflexibility in hierarchical arrangements. The inflexibility is likely to affect career planning in administration of research and education, where the efforts should be to attract specially qualified individuals in each discipline and to continue to nurture their sense of belonging and satisfaction of commitment to their specialised disciplines, and at the same time meet their reasonable expectations of promotion and status in their chosen discipline.

9.2 It is to be admitted that research and teaching cannot be done by everybody. It is an aptitude, which must be fostered and developed. There will not only have to be attractive and adequate pay scale, but also an improved procedure for promotion and better working conditions. The following three aspects should be taken into consideration in the management of personnel for research and education:

(a) the field from which personnel for research and teaching should be drawn;

(b) procedure for promotion from grade to grade to attract, develop and foster the specialised knowledge; and

(c) involvement of the research and teaching personnel in purposeful coordination.

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Views of Expert Committees

9.3 The two Expert Committees referred to earlier have considered the personnel management problems at the FRI and the important recommendations* made by them are reproduced in Appendix VIII. Many of these are yet to be implemented.

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*For fuller details, see the Report of the Second Expert Committee on Forest Research Institute & Colleges, Dehra Dun, 1965.

Recruitment of Personnel for Research and Education

9.4 Recruitment of personnel in the Forest Research Institute and Colleges, Dehra Dun and its centres is done at present in the following manner:—

(a) Personnel for teaching posts are drawn from the States on a tenure basis;

(b) Personnel for some of the research posts are similarly drawn from the States on a tenure basis; and

(c) Personnel for other posts of research are recruited from the open market through the UPSC, or by promotion from the establishment of the FRI and Colleges. Various percentages of posts in different grades upto Senior Research Officers are ear-marked as promotion quota.

9.5 For research and education in the States, the personnel are generally drawn from their own Forest Services on short-term basis. This is mainly because the research work is confined only to field problems in silviculture and the teaching work to turning out technicians. But since State Research Institutes would gradually come to be formed and more and more disciplines covered, it is necessary to spell out a policy regarding the fields from which recruitment should be made.

9.6 We have given careful consideration to the issue of direct recruitment of experts from the market vis-a-vis selection of forestry personnel for research jobs. We feel that more and more expertise should be developed in individuals with a forestry background by their taking up specialisation and making use of their aptitude for forest research and education. Our recommendations for forest education are also designed towards this end. Even though short-term tenures are recognised as a bane to continued efficiency in research, a permanent secondment of an individual to research and teaching jobs is also likely to induce a sense of complacency and to make replacement in case of a misfit difficult.

9.7 It is recalled that in Canada, all personnel for forest research (which is conducted by the Federal Government) belongs to Canadian Forestry Service. But in India, it will take some time before products of forest education on the lines recommended by us would become available in all disciplines. So adequate number of specialists in all disciplines may not be immediately available from the Forest Services. Direct recruitment of experts from the open market for forest research and education would have to be resorted to, whenever a shortage or non-availability of specialists arises in any discipline in the cadre of the Indian Forest Service. For basic research also, recruitment of specialists from the open market will have to be made in Government institutes as well as in the universities. It would be necessary to afford opportunities to them to have an idea of the practical aspects of forest management. The Second Expert Committee also recommended short-term forestry training in such cases.

9.8 The Commission recommends that personnel of the rank of Research Officers or equivalent and above in forest research and education in all the Central and State research institutes/centres should be selected from individuals preferably having forestry background. The posts under the Central Government in the cadre of the Indian Forest Service should include as many posts of the Central research and teaching institutes/centres, as are relevant. Direct recruitment of experts from the open market for forest research and education should be resorted to whenever the need arises, as mentioned in the previous paragraph. For State research organisations, recourse should be taken to obtain personnel on deputation from the universities on tenure basis in case of non-availability of specialists in the Forest Services.

9.9 Only a minimum tenure on deputation (with option for extensions) should be laid down for forest officers engaged in research and education. There should, however, be no permanent secondment, in order that merit, capability, specialised knowledge and aptitude become the overriding considerations for hiring or retaining research workers and teachers. Such personnel should be selected only after they have a spell of service in the field to build up necessary practical forestry background.

9.10 We also recommend that for the grades below the Research Officers, movement between field staff and research and teaching staff should be encouraged. The research and education personnel should thus feturn for a spell of field work after a stint in research and teaching, to help research and teaching always remaining oriented to applied situations.

9.11 The Commission recommends that a certain percentage of the posts of Research Officers, Research Assistants and Technical Assistants should be filled from State Forest Service Officers, the Forest Rangers and the Deputy Rangers/Foresters from the States.

9.12 The Commission further recommends that specialists recruited directly from outside the Forest Services, when appointed to forest research jobs in the Government research organisations or universities, should undergo special short courses on forestry in the Forest Research Institute, Dehra Dun. They should also be attached to the Forest Departments in the field to work for sometime on any project related to their disciplines. In addition, summer camps should be opened under the aegis of the Forest Departments to acquaint them with forest management in the field.

9.13 When the universities start research and teaching in forestry, it would be necessary to give their personnel an opportunity to work in Central and State research institutes/centres to let them have an idea of current requirements of Indian forestry. The university teaching will also be enriched if those currently doing research and teaching in Government organisations and familiar with conditions in Indian forestry are enabled to take up research and teaching in the universities. But for real mutual benefit to flow, experience with a reasonable length of service should also be a consideration.

9.14 The Commission, therefore, recommends that lateral movements for short periods of research workers and teachers should be arranged between the universities and the Central research-cum-teaching institutes, so that the demands and peculiarities of each are better understood by persons pursuing a common cause. Such movements should take place at the end of a service of ten years and over.

Career Planning

9.15. In spite of the recommendations of the Second Expert Committee that the short-term deputation of Forest Officers should be stopped and that the men should be promoted within their disciplines, no career planning has been done, nor any facilities or incentives afforded to an individual with a bent towards research or teaching to follow his desired pursuit. Career planning should, of course, start with the basic material, the fresh intake into the forest education courses, through specialisation for field jobs and for research and teaching, and finally end with the utilisation of expertise in a rational manner. The CFRE should discharge this responsibility.

9.16 To obviate the shortcomings of short-term tenure, we have recommended in paragraph 9.9 that there should only be a minimum tenure (with option for extensions) for the forest officers selected. At present, the seleciton is made by the Union Ministry of Agriculture for the Central research institutes/centres and the tenure period is five years, except in the case of teaching posts where the period can be extended upto a maximum of three years in exceptional cases. In the States, generally officers get transferred from post to post after three years.

9.17 The continuity of personnel in research and education is severed, in the case of forest officers and others alike, for two other reasons: (i) the pool seniority, which is interpreted in such a way that a person is selected for a higher post outside his specialised discipline, and (ii) vacancy in a higher post in the parent cadre outside research and education, for which an incumbent becomes eligible for appointment by virtue of his seniority-cum-merit. In either case, if no arrangement can be made for his promotion in his own discipline, the country stands to lose an expert in a particular discipline, and the research or teaching in his specialised subject, as well as in the new discipline or job to which he is transferred, is likely to suffer. Apart from a promotion from one grade to the next higher, the question of status of an individual is equally important in personnel management.

9.18. The promotion policy of the CSIR is of some relevance. In essence, the bye-laws governing the promotion are that an expert committee is appointed from amongst the members of the Executive Council, with three outside experts. This committee assesses the merits of all the Scientific and Technical Officers, engaged in scientific works, for promotion to the next higher grade after every five years of the appointment of the officer concerned against that post, and also when the said officer is at the maximum of the scale of pay of his grade for at least one year. Similarly, for Senior Scientific and Technical Assistants, departmental committees in the national laboratory or the Central Secretariat of the CSIR assess the merits for promotion to the next higher grade when they complete five years of their service in the grade in which they were appointed. The promotion to the next higher grade is done by a conversion of the post in the lower grade held by the officer.

9.19 The Commission, therefore, recommends that arrangements should be made to promote an individual within his discipline, if found merited for promotion. When a higher post in the discipline is not available, the post held by him should be converted to a higher grade as personal to him. In all cases, he should continue to remain in charge of the discipline or branch in which he excels. The States should also take similar steps in respect of merit promotion in the State research organisations. When an individual is sufficiently senior, he should also be accorded the necessary status and independence of working by directly bringing him under the head of the institute/centre. For instance, in the FRI if the officer is in charge of a Branch in a Directorate, he may continue to remain in charge of the particular Branch only, but he may be accorded a status equivalent to the Director and directly placed under the head of the Institute. Such an arrangement should continue only so long as the person serves the Institute or a centre. If he quits for any reason whatsoever, the post should automatically revert to the previous status.

9.20 We also recommend that wherever an Indian Forest Service Officer, or any other research worker or teacher in Central or State research organisations, becomes due for promotion to a higher grade in his parent cadre, because of an available vacancy, he should be retained, if he is willing and is found suitable for promotion by dint of merit in his research or teaching job, by according him the rank or the higher scale of pay in the same post he is holding in forest research and education. For this purpose and for awarding merit promotions, a number of floating supernumerary posts in different super-time scales should be created.

9.21 The Commission further recommends that the same principles as indicated in paragraphs 9.19 and 9.20 should be followed for retention and promotion of the State Forest Service Officers, Forest Rangers and Deputy Rangers/Foresters.

9.22 The selection for promotion by the Departmental Promotion Committees at present is based on written records in the annual Confidential Character Rolls. In the context of research and teaching works, the CCRs can only be of limited value. In the forest research institutes, there is at present no organisation for assessing the quality of work done by the research worker and teacher. As such, there is need to set up an Internal Evaluation Committee in each forest research institute/centre for periodical assessment of performance of research workers and teachers. For evaluation of their publications, the Committee may also ask for the written opinions from 2-3 outstanding experts in the concerned discipline from outside the forest research organisations if available. It is admitted that no system can be perfect in truly assessing the merits of research worker or a teacher, but we feel that the system of periodical internal evaluation should supplement records in confidential character rolls for determining the suitability of the research workers and teachers for promotion and/or retention in the research and teaching jobs.

Staff Research Councils

9.23 In the FRI as well as in the regional institutes/centres, there should be an effective body for reviewing the research work in progress so that mid-course corrections in the programme may be made if found necessary. There is need for staff at all levels to be consulted and be given an opportunity to contribute to the development of research in the institute/centre. As such, research workers in a discipline or a group of allied disciplines should meet at regular intervals to discuss the current research programmes, critically review them and suggest new programmes awaiting investigation. But in order to provide the necessary advice in connection with the planning and implementation of the research projects and programmes, there is urgent need for setting up a compact Staff Research Council (SRC) in each institute/centre, with a membership of not more than ten. In the final analysis, the President, FRI and the heads of the regional institutes/centres must assume full responsibility and should, therefore, have a final say in deciding upon the research strategy and programmes to be undertaken by the institute/centre. The role of the SRC should, therefore, be of a purely advisory nature.

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SECTION X

ACKNOWLEDGEMENTS

10.1 The Commission takes this opportunity to thank individuals, institutions and agricultural universities for their valuable suggestions. Thanks are due to all Members of the Study Group on Forest Research & Education, and specially to Shri S. K. Seth, President, Forest Research Institute & Colleges, who made valuable contribution in the preparation of the Report.

10.2 The Commission also wishes to place on record its deep appreciation of the work done by Shri S. B. Palit, Specialist (Forestry) who has helped in the preparation of the Report. Thanks are also due to Shri Anand Singh, and Shri M. C. Kukreti, Senior Technical Assistants for their help in various stages of the preparation of this Report.

Sd/- NATHU RAM MIRDHA
Chairman

Sd/- B. SIVARAMAN
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Sd/- H. R. Arakeri	Sd/- Hari Singh	Sd/- N. K. Panikkar
	Sd/- A. M. Khusro	Sd/- D. P. Singh
Sd/- Balwant Singh Nag	Sd/- M.V. Krishnappa	Sd/- M.S. Swaminathan
Sd/- P. Bhattacharya	Sd/- S.K. Mukherjee	Sd/- Triloki Singh
	Sd/- J.S. Sarma *Member Secretary*	

NEW DELHI:
March 23, 1974.

APPENDIX I

(See paragraph 1.6)

COMPOSITION OF THE STUDY GROUP ON FOREST RESEARCH AND EDUCATION

1.	Shri S.K. Seth, President, Forest Research Institute & Colleges, P.O. New Forest, Dehra Dun (UP).	Convener
2.	Shri D. P. Singh, Vice-Chancellor, G.B. Pant University of Agricultural Technology Pantnagar, P.O. Phoolbagh, Dist. Nainital (UP)	Member
3.	Dr. S. K. Mukherjee, Member, National Commission on Agriculture, Vigyan Bhavan Annexe, New Delhi-110011.	Member
4.	Shri R.C. Kaushik, Chief Conservator of Forests, Government of Himachal Pradesh, Simla.	Member
5.	Dr. B.K. Bakshi, Officer-in-Charge, Pathology Branch, Forest Research Institute & Colleges, P.O. New Forest, Dehra Dun (UP).	Member
6.	Dr. A. Purshotham, 383, Rajendra Nagar, Kaula Garh Road, Dehra Dun (UP).	Member
7.	Shri K.L. Lahiri, Inspector General of Forests, Ministry of Agriculture, (Department of Agriculture) Krishi Bhavan, New Delhi.	Member

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APPENDIX I—contd.

8.	Shri H.C. Dey, Director of Forest Education, Forest Research Institute & Colleges, P.O. New Forest, Dehra Dun (UP).	Member
9.	Dr. A.K. Banerjee, Divisional Forest Officer, Silvicultural Division (South), Midnapore (West Bengal).	Member
10.	Shri D.C. Pande, Conservator (Research Circle), Forest Department, Nainital (UP).	Member

APPENDIX II-A

(See paragraph 1.6)

QUESTIONNAIRE ON RESEARCH AND EDUCATIONAL REORGANISATION IN THE FORESTRY SECTOR

Forest Research

1. Do you think the present research set up in forestry both at the Centre as well as in the States is adequate enough to meet the changing needs of time?

2. If not why the State Government did not think of widening the forestry research base in their States.

2.1 Is it because of lack of funds?

2.2 Is it because of lack of trained research personnel in the various disciplines in forestry?

2.3 Is it because the States traditionally thought that research was the responsibility of Forest Research Institute and looked towards the Forest Research Institute for research results?

3. Do you think for better planning, coordination and implementation of forestry research both at the States and the Centre, forestry research be included in the Indian Council of Agricultural Research be redesignated as Indian Council of Agricultural and Forestry Research? If not why?

4. Can you see any advantages if forestry research becomes a part of the Indian Council of Agricultural Research? If not what are the disadvantages?

5. If you do not agree with the idea of encompassing forestry research within the folds of Indian Council of Agricultural Research, what are your suggestions to bring about advancement of forestry research in India?

6. How do you propose to bring closer touch with the State forest research, Central forest research and State Forest Services and private enterprises dependent on forest sciences?

7. To promote, guide and coordinate forestry research in India, do you feel the necessity of a Central organisation embracing the whole forestry research in this country?

8. If so, what would be the structure and functions of such a research 'coordinating body'?

9. Do you think if this research coordinating body is funded properly and State Governments are given money from this fund each State will be able to organise its fundamental forest research activities?

10. What do you think would be the role of Forest Research Institute and its various substations in case each State has a research institute of its own?

11. Do you think Forest Research Institute should be converted into a regional institute and several such regional institutes be formed to tackle regional problems?

12. Do you favour establishment of research stations on important timber crops from its growing to marketing like in agriculture crops? If so, which are the important tree crops you would suggest?

13. Can you identify the research disciplines in forestry which should be tackled by the States and which should be taken up by the Central institutes or do you think such identification should not be done?

14. If agriculture universities in your State wants to carry out silvicultural, hydrological and economic investigation on forestry and needs a portion of the forest areas as their research farm, will you set apart a portion of your forest area for experimental purposes and transfer it to the agriculture university?

15. What would be your reactions if the agriculture universities of your State invite you to send your field problems to them for experimental investigations by them?

16. Will you finance research investigations by the agriculture universities of your States, if they are prepared to accept the problems for investigation?

17. Within the present framework of the Indian Forest Service, research does not find a place because the training of forest scientists and the recruitment to the Indian Forest Service are quite contrary to each other. How do you propose to obviate this difficulty?

18. Do you think a separate research cadre within the existing Forest Service is essential to promote forestry research and maintain continuity of research?

19. Do you think that scientists should be recruited in the Forest Service and continued on the job and suitable changes in the establishment rules be made?

20. Give a blue print of a Forest Research Institute to be set up in your State based on your needs and experiments.

Forest Education

21. What do you think of the education objective of future Indian foresters knowing that there will be an increasing demand for expertise in the Service?

22. Have you an idea of the type of expertise private sector will need in the future years to come?

23. Do you have an idea of the type of foresters public corporate bodies will be needing in the future?

24. Do you think there is a need for a greater comprehension of related sciences and commercial and economic practices for a forester in India?

25. If so, where do you think such a forester be trained?

26. Do you think a general Degree in Forestry awarded by the Agriculture Universities will put the forestry sector on some kind of scientific footing?

27. Do you think this preselection training expertise coupled with in-service training at Dehra Dun will be a good combination for future foresters in this country?

28. The future foresters in India to our mind will be either of the following:

Professional forester with regulatory functions.

Development forester with modern commercially oriented outlook.

Extension forester or Social forester—Concerned with social needs of forestry.

Research forester—Forest scientist.

Do you agree with our concept? If so do you not think that the existing training and recruitment procedure will not yield such a forester of the future?

29. What is your suggestion to train the above outlined future foresters of India?

30. Do you think that a formal Degree in Forestry may open up future opportunities to foresters in India to pursue high academic Degrees in related fields and ultimately benefit the Service?

31. How do you propose to build up a research and teaching cadre within the framework of the Indian Forest Service? What modifications of the existing recruitment rules you would suggest?

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APPENDIX II-B

(See Paragraph 1.6)

QUESTIONNAIRE ON STARTING FORESTRY EDUCATION IN THE AGRICULTURE UNIVERSITIES IN INDIA

I. Forestry Education in Agriculture Universities

1. Has the Model Act for agriculture universities in India which was circulated by the Indian Council of Agricultural Research been accepted by your university?

2. If yes, has it been accepted in its entirety?

3. If not, why?

4. In the Model Act, agriculture was broadened to include forestry. Did you agree to this concept of broadening the definition of agriculture?

5. If yes, have you started a Department of Forestry in your university?

6. If you have not started a separate Department of Forestry, have you started a course in Forestry to be taught to the agriculture graduates as a special paper?

7. Do you have any sort of forestry programme in your university? If so, give details giving the course content and number of hours being spent on the course.

8. If you did not start a forestry programme in your university, what were the reasons for it?

    8.1 Did you fear that the Forestry Graduates would not find any employment?

    8.2 Did you think the students would not be interested in taking up forestry Degree?

    8.3 Did you find difficulty in procuring teachers for teaching forestry?

8.4 Did you feel you are not equipped owing to lack of research base in your university to support your teaching programme?

8.5 Did you find opposition and non-corporation from the serving Government forest officers?

8.6 Did you feel there was no necessity of starting a forestry programme in your university?

II. Organising Forestry Education in your University

9. Do you not feel that for a balanced land utilisation programme in the future some sort of a common programme of education of resource professionals is necessary?

10. If so, where do you think the future agriculturists, foresters, animal husbandry men should be trained?

11. If a policy decision is taken to introduce forestry as an university education which are the universities which should impart this training?

12. Do you think the concept of demand in the present and future market should influence our education policy?

13. Do you enrol students in your university in the agriculture sciences courses purely on the basis of demands?

14. If not, why should this concept influence your thinking in starting a Degree course in forestry?

15. Forestry education should be a part of an agriculture university for the promotion and dissemination of forestry knowledge. Do you agree with this concept or not?

16. If you start a forestry educational programme will you face any opposition from your State Government or from the State Forest Service?

17. What are the likely oppositions you may face?

18. Are you at present equipped to award a B.Sc. (Forestry), M.Sc. (Forestry) or a Ph.D. in Forestry?

19. If not, what are possible facilities that you may require for starting these various courses in forestry?

20. If you are asked by the State Government to start a Degree course in forestry, how will you go about organising it?

20.1 Will you first start it as a special subject in the agriculture programme and then develop slowly in a full-fledged Department? or

20.2 Will you start a Department of Forestry straightaway by recruiting teaching and research staff from the existing Forest Service and on this nucleus build up your organisation?

21. What are the difficulties you may confront with if you are asked to initiate an undergraduate and graduate level programme in forestry?

22. How do you propose to surmount them?

23. Give a short action plan of how will you organise a forestry education programme at the graduate and under-graduate level in forestry?

24. Are you prepared to take up research programmes in forestry sciences?

25. If so, what are the essential requirements that should be fulfilled before you take up any forestry research programme in your university?

26. Give an action plan of starting a research programme in related sciences in forestry—if you are to initiate the programme now.

27. Will you accept students for Ph.D. programme if special scholarships are given to pursue forestry research problems?

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APPENDIX III

(See Paragraph 2.4).

CONSTITUTION AND TERMS OF REFERENCE OF THE SECOND EXPERT COMMITTEE ON FOREST RESEARCH INSTITUTE AND COLLEGES, DEHRA DUN

I. Appointment of the Committee:

In 1964, the Government of India in their resolution No. 13-3/63-F, dated the 3rd October, 1964, appointed a Second Expert Committee consisting of the following:—

1. Prof. M. S. Thacker, Member, Planning Commission—Chairman.
2. Shri Hari Singh, Inspector General of Forests—Member.
3. Prof. M. V. Laurie, Professor of Forestry, Department of Forestry, Commonwealth Forestry Institute, Oxford University—Member.
4. Dr. G. P. Kane, Deputy Director General, Dte. General of Technical Development, Ministry of Industry—Member.
5. Prof. P. Maheshwari, Head of the Department of Botany, University of Delhi—Member.
6. Shri S. N. Tulsiani, Under Secretary to Government of India, Ministry of Food & Agriculture, Department of Agriculture—Secretary.

II. Terms of Reference:

The terms of reference of the Committee were:

(a) to review the progress of research done at the FRI during the past 8 years (since the appointment of the Champion Committee) and to make an assessment of research with a view to determining its usefulness in relation to extension of work;

(b) to study the organisation of the FRI including the regional research centres at Bangalore and Coimbatore and to suggest improvements;

(c) to study the staff position of the Institute, viz. overstaffed or provided with staff which is not of the right calibre;

(d) to study proposals for improving the quality and progress of research;

(e) to advise on steps to be taken for ensuring efficiency in the conduct of investigations;

(f) to advise on the lines of work which could be adopted in future having regard to technical personnel, equipment and financial resources available to the institute;

(g) to advise on steps to be taken for establishing liaison with other research institutions so as to derive advantage from their work and avoid duplication of research; and

(h) to advise on steps to be taken to secure publicity and quick application of the results of research.

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APPENDIX IV

(See Paragraph 2.9)

LIST OF ORGANISATIONS ENGAGED IN FORESTRY AND/OR FORESTS PRODUCTS RESEARCH

I. Institutes and Research organisations engaged in forestry research directly:

1. Forest Research Institute, Dehra Dun.
2. Regional Forest Research Centre, Bangalore.
3. Regional Forest Research Centre, Coimbatore.
4. Forest Research Laboratories in Uttar Pradesh, Madhya Pradesh, and Maharashtra.
5. State Silvicultural Research Centres.
6. Central Arid Zone Research Institute, Jodhpur.

II. Institutes engaged on research in composite wood:

1. Regional Research Laboratory (CSIR), Jammu Tawi (Jammu & Kashmir).
2. Regional Research Laboratory (CSIR), Jorhat (Assam).
3. Central Building Research Institute, Roorkee.
4. Indian Plywood Industries Research Institute, Bangalore.

III. Organisations engaged in research work on wood preservation:

1. Defence Research & Development Laboratories, Kanpur.
2. Naval Metallurgical Research Laboratories, Bombay.
3. Zoological Survey of India, Calcutta.

4. Department of Marine Biology & Oceanography, Cochin University, Cochin.
5. Zoological Research Laboratory, University of Madras, Madras-5.
6. Department of Zoology, Andhra University, Waltair.
7. Central Institute of Fisheries Education, Kakori Camp, Jayaprakash Road, Bombay-58 (AS).

IV. Institutes engaged in research on pulp and paper:

1. Forest Research Institute, Dehra Dun.
2. Regional Research Laboratory (CSIR), Jorhat (Assam).
3. Regional Research Laboratory (CSIR), Jammu Tawi (Jammu & Kashmir).
4. Regional Research Laboratory (CSIR), Hyderabad-9.
5. National Chemical Laboratory (CSIR), Poona-8.
6. Institute of Paper Technology, Saharanpur, Uttar Pradesh.

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APPENDIX V

(See Paragraph 4.6)

THE UNDER-GRADUATE AND POST-GRADUATE COURSES CONCERNING DIFFERENT ASPECTS OF FOREST EDUCATION IN SOME UNIVERSITIES IN THE UNITED KINGDOM·

1. **Oxford.** The University of Oxford had been running an under-graduate course in forestry leading to a B.A. Degree in forestry for a long time. But at present the University has devised an Honours course which leads to the B.A. Degree in 'Agricultural and Forest Sciences', specifically designed to give a broad education in subjects fundamental to an understanding of the biological sciences and associated economics. This has been designed to facilitate a wide choice of careers, for instance, in teaching, industry, planning or local governments, rather than follow a vocation in agriculture or forestry. This is a three year course. For those contemplating a career in forestry, the post-graduate M.Sc. course in 'Forestry and its Relation to Land Management' has been designed. This course is for one year. The Departments of Agricultural Sciences and Forestry and the Institute of Agricultural Economics in the University combine the teaching for the Honours School of Agricultural and Forest Sciences and for the post-graduate M.Sc. courses which follow from it. For the three year under-graduate course, the specialisation starts in the third year and the choice is between economics and sciences as applied to agriculture and forestry. Economics specialists take two basic courses on general topics in economics, plus a choice between ***either*** the mathematical and statistical aspect of economics, **or** planning and development in agriculture and forestry. Those wanting to specialise in the biological sciences have to take two papers at least for major specialisation, either in animal sciences, or plant science, or in soil science plus an additional paper on any of the others, or they may concentrate on plant sciences alone. The M.Sc. course in 'Forestry and its Relation to Land Management'—of one year's duration—covers: (i) Policy, planning and organisation of land for forestry and dependent purposes, (ii) Management of forest land, (iii) Uti-

lisation of forest land and products, and (iv) one of the following groups of applied sciences:—

(a) Forest soils, ecology and physiology;

(b) Forest pathology and entomology;

(c) Forest botany and plant taxonomy;

(d) Anatomy and properties of wood;

(e) Genetics and breeding of trees;

(f) Design and analysis of forest surveys and experiments.

2. **Edinburgh.** The University of Edinburgh also used to award a Degree of B.Sc. in Forestry. But at present, it conducts a course leading to both the Ordinary Degree and an Honours Degree of Bachelor of Science in 'Ecological Science'. The Ordinary Degree extends over three academic years. The subjects of study include Biology, Botany, Chemistry, Ecology, Economics, Forestry, Geography, Geology, Physics with Mathematics (Introductory), Resource Management, Wildlife and Fisheries Management, and Zoology. A candidate for an Ordinary Degree must take seven courses, which include not less than two higher courses. The course in Ecology will be obligatory. The Degree with Honours is awarded in four Honours Schools, namely, Ecology, Forestry, Resource Management, and Wildlife and Fisheries Management. Every candidate for an Honours Degree would have to take eight courses of instructions, which shall include not less than three higher courses. It is seen that the syllabus is designed to give a graduate broad-based knowledge which would mean greater choice of a career.

3. **Cambridge.** The University of Cambridge offers an under-graduate course leading to a B.A. Degree in 'Land Economy'. It is a three year Land Economy Tripos, an Honours examination taken in one or two parts. Since Economics is closely allied with Land Economy, Part I of the Economics Tripos, taken in the first year of residence, is preferred for the candidate for the Land Economy Tripos. There is also a primary examination, generally in the second year, in which there is a paper on 'The Organisation of Agriculture and Forestry'. In the final examina-

tion for the Land Economy Tripos, six papers are to be offered by candidates, of which two papers in Land Economy are obligatory. Four other papers are chosen from among the following:—

> Land Law; Comparative Land Tenure; Principles of Land Values; Social Land Use; Housing and Housing Policies; Natural Resource Development; The Economics of Agriculture in Developed Countries; and The Economics of Agriculture in Less Developed Countries.

It would be seen that in this University also the syllabus has been prepared with much care, so that the graduates in Land Economy may have a wide choice of professional callings, namely as a surveyor who evaluates and manages land and natural resources; as a town and country planner, who plans the use and development of land on a national or regional scale; as an agricultural economist or development economist responsible for the economic planning and management of agricultural, forestry and other development enterprises. The wider world of finance, commerce and industry presents opportunities too, specially in the executive ranks of the construction industry. Opportunities for higher Degrees (M.Sc., Ph.D. etc.) in Land Economy, however, are limited to only such graduates in Land Economy, who register themselves as research students of the university. The research field is a wide one and the scope of research activity covers forestry also. For instance, one recent title accepted for a Ph.D. thesis in land economy was 'The use of Land for Forestry within the Proprietary Land Unit'

4. **Aberdeen.** There are, however, two Universities in U.K. viz. Aberdeen and North Wales, which are still running courses for a Degree in Forestry. The University of Aberdeen has a curriculum both for an Ordinary B.Sc. Degree in 'Forestry', extending over three academic years and that for an Honours Degree, which requires four years. For the Ordinary Degree, during the first year students attend classes in Chemistry (same as for B.Sc. in Agriculture) and in Geology and two other subjects selected from Botany, Mathematics, Natural Philosophy (Physics) and Zoology in accordance with the Pure Sciences time table. They also attend the course of lectures and practical periods entitled 'Introduction to Forestry'. In the second and subsequent years the students receive instruction in the Departments of Forestry, Soil Sciences, Natural

Philosophy, Statistics and Engineering in the eight groups of subjects which form the core of forestry education. These are:

(1) Forest Botany

(2) Foundations of Silviculture

(3) Practice of Silviculture

(4) Forest Mensuration

(5) Forest Management

(6) Forest Protection

(7) Timber Management

(8) Forest Economics, Policy and Planning.

5. **North Wales, Bangor.** University College of North Wales, Bangor, runs Degree course for B.Sc. in 'Forestry', as well as B.Sc. in 'Wood Science'. Both are three year courses. In the case of the Forestry Degree, upgrading from the pass to the Honours studies was done in 1955. The post-graduate school for Ph.D. has also been built up. In the first year of both the Degree courses in Forestry and in Wood Science, there is a common syllabus, covering World Forestry; Introduction to Environmental Forestry; History and Basic Principles of Forest Management; Elementary Forest Mensuration; Silviculture; Forest Policy; Biometrics; Introductory Harvesting; Role of Economics in Forestry and Wood Sciences; Arboriculture; Anatomy; Structure and Properties; Utilisation of Wood as a raw material. The students for Degree courses in Wood Science will have to take 'Forestry and Wood Science', together with two subjects from Forest Biology or Biology, Bio-Chemistry and Social Science, Earth Science, Basic Science, Mathemamatics for Science, Physics, Chemistry and Economics. For the Forestry Degree the syllabus for the second and third year covers Research Silviculture; Forest Protection; Forest Policy; Forest Law; Advanced Mensuration; Preparation of Management Plans; Managerial Economics for Foresters; Tropical Forestry; Harvesting; Erosion and its Control; Computer Programming; Operational Research; Additional Utilisation; Assessment of Site Potential; and one foreign language. The Honours students have also to undertake field work for a projected thesis in the final year.

For the Degree Course in Wood Science, second and third year covers the following topics in Wood Science and Industrial Economics:—

(i) Wood Structure—Properties;

(ii) Wood properties—Utilisation; and

(iii) Economics.

In Addition, subsidiary subjects are to be chosen from two groups, namely, Group I: Surveying and Field Engineering, and Forest Economics, Group II: Forest Zoology, Physics, Chemistry, Economics and Bio-Chemistry.

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APPENDIX VII

(See Paragraph 8.11)

LIST OF PRIORITY R&D PROJECTS (CORE SCHEMES) IN THE FORESTRY SECTOR RECOMMENDED BY THE SUB-SECTOR OF FORESTS, LAND AND SOIL OF NATIONAL RESOURCES SECTOR OF THE NATIONAL COMMITTEE ON SCIENCE AND TECHNOLOGY

Sl. No.	Name of Project	Man-years for 5 years	Funds (Rs. in lakhs) Indian	Foreign	Total
1	2	3	4	5	6
1	Studies of introduction of important exotic tree species including seed procurement	650	50·40	3·00	53·40
2	Studies on rehabilitation of degraded forests	100	8·50	Nil	8·50
3	All-India Centre-cum-States co-ordinated project for the Genetic Improvement of important forest tree species	1,535	84·00	Nil	84·00
4	Forest productivity	75	6·00	Nil	6·00
5	Survey of insect tests and diseases and their control	605	48·00	Nil	48·00
6	Studies on wind-breaks and shelter-belts	3,500	150·00	Nil	150·00
7	Studies on sandal spike disease and its control	110	11·00	Nil	11·00
8	Studies on techniques of improvement of degraded grass reserves, pastures, forest grazing ground and plantation areas	875	40·00	Nil	40·00
9	Preparation of design/data for plywood, hardboard, particle board, saw-milling and wood-working machinery	80	9·30	Nil	9·30
10	Extension of punched card method for field identification of lesser known species of timber ..	40	6·20	Nil	6·20
11	Improved methods of natural seasoning of timber products ..	30	5·50	Nil	5·50
12	Development of particle board for tropical climate	40	11·50	4·00	15·50

APPENDIX VII—contd.

1	2	3	4	5	6
13	Retrieval of wood residues from forest and factories	45	10·00	2·00	12·00
14	Development of high yield process for production of paper and paper board for packing from indigenous forest based raw materials	120	26·00	22·00	48·00
15	Development of coated papers for printing from indigenous raw materials	105	36·00	20·00	56·00
16	Minor Forest Products survey of resources, markets and industries	1,960	125·32	nil	125·32
17	Cultivation and exploitation of commercially important medicinal and aromatic plants	720	28·48	1·00	29·48
18	Investigations on commercially important gums and gum resins	385	15·21	nil	15·21
19	Investigations on the use of some chemicals for increasing resin yield in pines	185	7·00	nil	7·00
20	Investigation on beedi leaf (*Diospyros melanoxylon* Roxb)	40	2·05	nil	2·05
21	Menthol from delta-3-carene, the major constituent of Indian turpentine ex-*Pinus roxburghii*	95	11·11	2·00	13·11
22	Logging and operational efficiency research project	425	48·30	2·00	50·30
23	Determination of the best method of censusing populations of important wildlife species	900	67·00	5·00	72·00
24	**Wildlife Research and Education** Directorate at the FRI & Colleges, Dehra Dun	165	15·00	3·00	13·00
25	Hydrologic response studies on small watersheds under existing and introduced land use variations	6,440	445·00	10·00	455·00
26	Forest soil-cum-vegetation survey	1,170	75·27	3·43	78·70
27	Establishment of postentry quarantine and phytosanitary unit at FRI, Dehra Dun	90	13·25	nil	13·25
28	Setting up of a radio-isotope laboratory for tree physiology studies	55	6·00	nil	6·00
29	Establishment of a data processing centre at FRI	275	100·00	nil	100·00
	TOTAL	20,815	1461·39	77·43	1538·82

APPENDIX VIII

(See Paragraph 9.3)

IMPORTANT RECOMMENDATIONS OF THE FIRST AND SECOND EXPERT COMMITTEES ON THE FOREST RESEARCH INSTITUTE AND COLLEGES, DEHRA DUN, WITH REGARD TO PERSONNEL MANAGEMENT

1. The First Expert Committee proposed, amongst others, the following changes in the matter of personnel management:—

(i) The cadre of Junior Research Officers, Class II should be abolished and an integrated Class I Service with a proper structure on the lines of established Central Services with provision for officers passing from the Junior to the Senior scale automatically after a specified service, subject to the work and conduct being satisfactory, should be formed.

(ii) The deputation terms granted to forest officers appointed on tenure basis should be liberalised by granting their grade pay in the State plus a special pay of not less than Rs. 250 per month.

(iii) The status of a field of work of a section of a Branch or an independent Branch should not be too rigid. Fields of work which meet essential needs and which require specialists to run them should not be expended beyond the requirements of the Institute as a whole competing for staff or funds with major units such as Silviculture or Cellulose and Paper Branch.

(iv) In order to afford more avenues of promotions to Class III staff, the number of selection grade posts should be increased.

(v) The prefix 'Junior' should be dropped from the designation of the post of Junior Research Officers.

(vi) Members of Class III and IV staff should be given maximum opportunities for promotion within the framework of the general recruitment rules, resort to outside recruitment being made only if persons with adequate qualifications and experience are not available.

2. The Second Expert Committee made recommendations for changes in the policy of personnel management, of which the following may be quoted:—

(i) All the research posts should be opened to Forest Officers from States and to directly recruited scientists alike.

(ii) Short-term deputation of Forest Officers from the States should be stopped. Instead, a two-year probationery period of deputation should be followed by a five-year stay with the option of extension for further periods.

(iii) Deputation of scientists from the Central Scientific Services on terms similar to those given to Forest Officers should also be considered.

(iv) Arrangements must be made whereby men can be promoted within their disciplines; this may take the form of creation of a number of supernumerary posts which can be allocated at various levels to different Branches.

(v) There would be three floating posts (in Principal Scientific Officer grade—Rs. 1,600—1,800) to be used for promotion of particularly deserving individuals within their own Branches. The holding of this grade would not necessarily mean that the individual would be the head of the Branch, though this might often be the case.

(vi) The scale of pay and emoluments of Research Assistants should be fixed in relation to the academic qualifications required for the post.

(vii) In suitable disciplines, Forest Rangers might be taken for these posts on deputation.

(viii) All promotions should be made by a Selection Committee on merit and not merely on seniority alone. The scheme of 'merit promotions and advance increments' should be implemented expeditiously. Awards under it must be made only on the basis of recommendations of a specially constituted Committee.

(ix) Special short-term courses should be instituted for directly recruited scientific staff so as to give them working knowledge in forestry.

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